MARINE REVIEW

Entered at Cleveland Post Office as Second-class Mail Matter.

VOL. XXIII. Published every Thursday at 418-19 Perry-Payne Bldg., by the Marine Review Pub. Co. CLEVELAND, O., APRIL 18, 1901. Subscription $3.00 a year. Foreign $4 50 a year. No. 16

MANAGER OF STEEL CORPORATION SHIPS.

Shortly after official announcement was made of the organization of the United States Steel Corporation, it was said that the position of general manager of the company's fleet of 112 steel vessels on the great lakes had been offered to Mr. A. B. Wolvin of Duluth, who is president of the Lake Carriers' Association and one of the best known managers of vessels on the lakes. Mr. Wolvin was said to have declined the offer, on account of other important business interests requiring his attention. When it was announced later that Mr. James Gayley of the Carnegie Co. had been made first vice-president of the steel corporation, in charge of mines, docks and ships, it was concluded at once that the policy of handling the ore business of the lakes would be by direct representation, instead of employing any of the big agencies, such as Pickands, Mather & Co. or M. A. Hanna & Co., but it was not expected that Mr. Gayley would go beyond the present Carnegie organization for a general manager. The announcement, therefore, that Mr. Wolvin has been selected for the place, and that the duties have been so arranged that he has accepted it, came as a surprise to the different interests involved. It is a tribute to Mr. Wolvin's ability as an organizer and manager of vessels. He is certainly fitted for the position. In the past few years he has organized companies that have built some twenty steel freighters, all of the very largest and finest kind, and several of them designed for salt water service. He is thoroughly acquainted with everything pertaining to the construction and operation of ships, as he has advanced with the business from the position of cabin boy on one of the earliest of the wooden propellers on the lakes.

It is announced that the operation of the ships will involve the organization of a company subsidiary to the United States Steel Corporation, with D. M. Clemson of the Carnegie Co. as president. Mr. Clemson was closely associated with Mr. Gayley in the management of the ore business of the Carnegie Co. before the consolidation. It is said that as general manager in charge of vessel operation Mr. Wolvin will remain at Duluth, establishing headquarters there. Mr. E. S. Mills, heretofore manager of the Pittsburg Steamship Co. and Cleveland representative of the Carnegie ore and sales interests, will be assistant general manager, with headquarters in Cleveland. The Cleveland offices, it is understood, will have charge of vessel dispatch, distribution of ore to works and allotment of ore to docks. The 112 vessels in the fleet are capable of moving in a single season something more than 10,000,000 tons of ore from the head of Lake Superior, running up light, and an allotment of the corporation ore to the different fleets will, of course, be made at once, but no announcement has been made as yet as to whether the vessels will or will not all be taken into one office for the season now about to open.

DESIGN FOR NAVAL ARCH.

The design for the naval arch to be erected in Battery park, New York, has been accepted and the undertaking has already advanced to a sufficient stage to pronounce it a success. It is in no way connected with the movement to erect a Dewey arch, which, as is known, was abandoned some time ago. Admiral Dewey has, however, given his unqualified approval of the present enterprise. The design accepted is that of Ernest Flagg, the architect of the Corcoran art gallery in Washington, one of the most beautiful structures in that city of beautiful buildings. The arch will be about 170 ft. high, almost twice the height of the Dewey arch and a little taller than the Arc de Triumph in Paris. It will be 125 ft. wide. The arch will be surrounded by a quadriga of sea horses, which will be flanked by ancient war barges, filled with trophies. At the bases of the piers of the arch there will be four great bas reliefs typifying memorable events in our naval history—Farragut in the rigging, Paul Jones on the deck of the Bonhommie Richard, Perry on Lake Erie and the death of Lawrence. The approach to the arch from the harbor will be through a beautiful sea gate enclosure in a sufficient basin and landing stage. Two piers will extend a short distance beyond the sea wall and at the end of each will be an immense beacon. The arch will stand about 100 ft. back of the river edge of the basin and will be approached by steps and terraces.

CLEVELAND-CLIFFS CO.'S OPTION DECLARED OFF.

The citizens of Marquette, Ishpeming, Negaunee, Gladstone and the Michigan peninsula in general will be interested to learn that the option of $9,500,000 upon the mines and mineral rights of the Cleveland-Cliffs Co. to the United States Steel Corporation has been declared off and that the company will continue as an independent factor in the mining of ore, manufacture of charcoal pig iron, development of hardwood lands, operation of railways and kindred interests with which it has been so long identified.

Percy & Small, Bath, Me., have found their ship yard too small and have just purchased adjoining land for an additional ship building berth.

BILLION AND A HALF IN EXPORTS.

The fiscal year 1901 seems likely to exceed any preceding year in its record of exports from the United States. The steady growth of our exports from $392,000,000 in 1870 to $835,000,000 in 1880, $1,030,000,000 in 1892 and $1,394,000,000 in 1900 has been a subject of much attention and much favorable comment, but it seems that 1901 is to surpass the record of the year 1900 and bring the export figure nearly if not quite to the billion and a half mark. The March import and export figures, just completed by the treasury bureau of statistics, show a total exportation from the United States in the nine months ending with March, 1901, of $1,140,170,728, or $86,540,032 in excess of last year, which held the highest record in the history of our export trade.

Another interesting fact developed by the March figures of our foreign commerce is that imports seem likely to show a decided decrease in 1901 as compared with 1900, while the exports are showing the increase above indicated. The figures of the nine months ending with March, 1901, show a decrease of $42,292,639 in the imports, as compared with those in the corresponding months of the preceding year. Thus the excess of exports over imports in the nine months under discussion is more than $100,000,000 greater than in the corresponding months of last year and far beyond the figures of any preceding year. The excess of exports over imports in the nine months ending with March, 1901, is $540,687,337, as against $411,854,666 in the corresponding months of 1900, an increase of $128,832,671 in the net excess of exports over imports for the nine months of 1901 as compared with the corresponding period of the fiscal year 1900.

The farmers are apparently the chief beneficiaries in this remarkable increase in our exports, and are in the fiscal year 1901 showing greater gains in their exports than are the manufacturers, whose record in 1899 and 1900 showed a greater percentage of growth than those engaged in agriculture. The analysis by the bureau of statistics of the March exportations of domestic merchandise has not yet been completed, but that of the eight months ending with February showed an increase of $88,000,000 in the exportation of agricultural products and but about $2,000,000 each in manufactures and products of the mines, forests and fisheries. This check in the growth of the exportation of manufactures is more apparent than real, being due in part to the absence of statistics of exports to the Hawaiian islands and to the separation of the trade of Porto Rico from the regular statements of foreign commerce in the returns to the bureau of statistics; while the temporary reduction in the exports to China, due to the disturbed conditions in that country, also accounts for the lack of growth in the figures relating to the exportation of manufactures.

The reduction in the import figures is largely due to the reduction in price of the materials imported by manufacturers, and occurs chiefly in the class "articles in a crude condition which enter into the various processes of domestic industry." Yet, while the figures of value are materially reduced, the quantities of these particular articles imported for use in manufacturing show little reduction. In india rubber, for instance, the fall in value of the imports during the eight months ending with February, 1901, as compared with the same months of 1900 is from $21,000,000 in 1900 to $16,000,000 in 1901; yet the reduction in quantity is only from 33,000,000 lbs. in 1900 to 32,000,000 lbs. in 1901, showing that the chief reduction is in the price rather than the quantity imported. In raw silk the value of the importations falls 51 per cent., while the quantity falls but 42 per cent., and in other importations of manufacturers' materials the reduction in value is greater than in quantity.

TO MAKE THEIR OWN RIVETS, BOLTS, ETC.

Ship builders of Scotland have in the past bought rivets and bolts from a number of small concerns that engaged in that line of manufacture. Recently these manufacturers entered into a consolidation and now the ship builders are arranging to make their own rivets, bolts, etc. John Thomson of Glasgow, who is now in Pittsburg, says of the plans on this score: "We are going to build a rivet and bolt works at home, and I have come here to look at machinery for the plant. There will only be an outlay of about $250,000, but a great deal can be turned out from small works of this kind of material. The new mill came about in this way. All the rivet and bolt works effected a combination some time ago and advanced the prices to a point where the ship builders on the Clyde felt something had to be done for their own protection. They got together and hit upon the scheme of building a rivet plant for themselves. The venture is co-operative in a sense, as the stock is held by the ship building firms in a ratio to the amount of business they have for such a plant. I expect to buy the machinery while here to equip it."

The iron market in all departments shows continued signs of strength. Pig iron is scarce and grows scarcer every day. Nearly all the furnaces that make pig iron for sale are almost entirely sold up for the first half of the year. An advance in steel rails to $28 per ton is expected shortly on account of the heavy orders that have been booked of late.

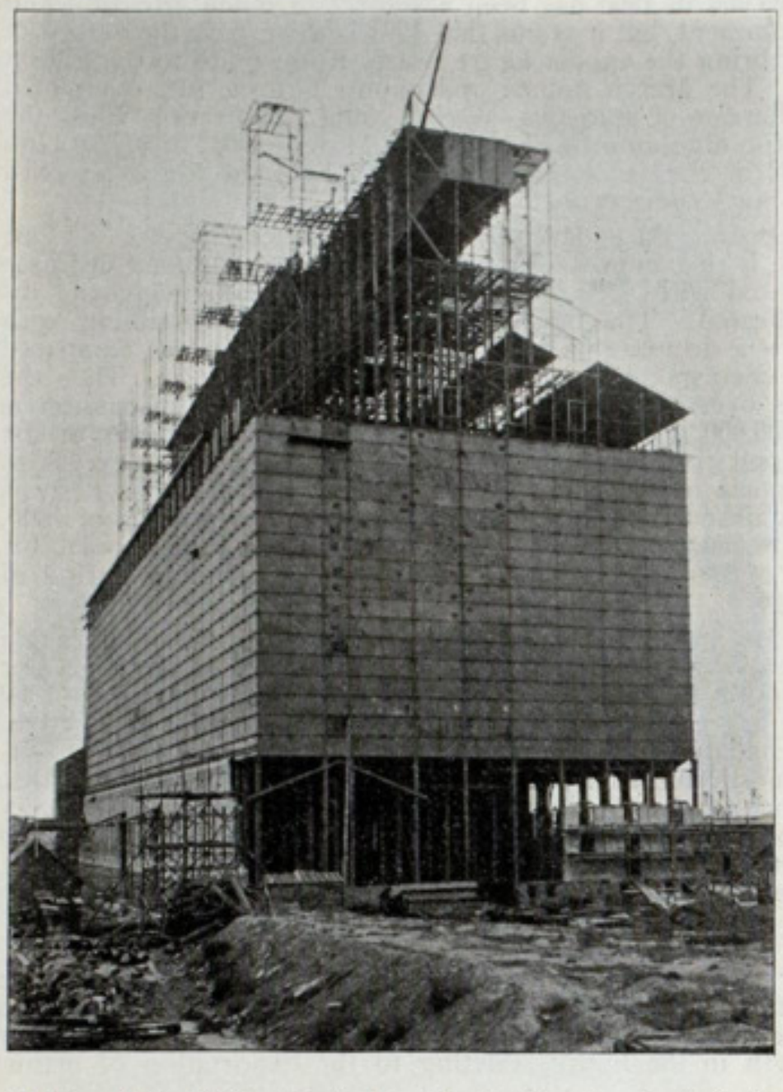
The ocean going tug Nellie Pearson was launched from N. C. Peterson's ship yard at the Sumner Iron Works, Everett, Wash., this week. Her dimensions are: Length 65½ ft.; beam 15 ft.; depth 5½ ft.

It is said that W. P. Palmer, who has been tendered a vice-presidency of the United States Steel Corporation, with charge of sales, has declined the position and plans an early trip to Europe.

EVOLUTION OF GRAIN ELEVATORS.

DESCRIPTION OF THE GREAT NORTHERN ELEVATOR AT THE HEAD OF LAKE SUPERIOR—SQUARE STRUCTURE OF STEEL.

Most people realize the advance of the past few years in the construction and operation of all forms of public utilities, the increase in the unit of carriage both by land and water, the advance in labor-saving machinery and the wonderful adaptability of the means to the end. But in all this improvement the grain elevator did not share until a very short time ago. To most the fact that it has changed at all is not realized. Behind its massive walls the processes carried on are in Greek to the passer by. But there has been an evolution in elevators as complete and revolutionary as in anything else of the long list. The day of wood is passing away. The day of old methods of handling in elevators has gone, never to return, and the one man who has had most to do with the change is Mr. James J. Hill of the Great Northern Railway, whose feats in the financial world are more talked about than his practical knowledge of the railroad and associated business, though the latter is probably the more remarkable. Mr. Hill's roads handle to the head of Lake Superior and to Minneapolis about 100,000,000 bushels of grain a year. This fact is sufficient reason for his advance in methods of elevator construction and grain handling. The cost of operating an old-style wood elevator is very large, and one of the chief items is insurance. This is from 2 per cent. upward, and when the house with its contents is worth millions the insurance item is a big one. To save this and to do away with numerous men was Mr. Hill's plan, and he began with the erection of a vast steel tank elevator at Buffalo three years ago. Circular steel tanks were not just what was wanted and when he found it necessary two years ago to increase his terminal capacity at the head of Lake Superior he decided to have square bins of steel. This was then supposed an impossible construction; the depth of bins proposed for the house was thought an impossibility and the chances of raising wheat 250 ft. on friction belts carrying buckets was looked upon askance by experienced builders. All these things and many more as remarkable innovations have been accomplished by the builders of the Great Northern elevator S, at the head of Lake Superior.



This is what is known as a terminal elevator, one that receives grain from the cars that bring it from the farms and stores until wanted for shipment by water to its destination. As such it must have appliances for cleaning the dirt contained in the grain as it comes from the threshers, for weighing and storing it, for maintaining the integrity of various grades, or brands, as they might be called, or for giving to individual shippers special bins for their own grain. It must also be fitted to weigh out to ships with the utmost exactness, to load rapidly and to carry on all its operations under the watchful eye and close scrutiny of the officials of the state, who are put in charge to care for the interests of the shipper. In the construction of a terminal elevator, therefore, many new mechanical refinements are necessarily introduced, and mechanical contrivances must be twisted and fitted to meet the requirements of the situation. While steel elevators have been built before they have been marine and storage merely, of simple design, and never containing the niceties of construction that are placed in the terminal house. To work out these principles and appliances in cold steel, so to speak, all on a scale far beyond anything attempted heretofore (there are ten miles of steel spouts alone in this elevator) has required a daring and skill far exceeding that shown by any engineer of a wood house, however vast.

A GRAIN STORE HOUSE OF ENORMOUS CAPACITY.

Nine freight cars, grain laden, can be brought into this elevator on each of two tracks at one time, and simultaneously unloaded. Each train of nine cars is attached to a grip cable that runs over a sheave of 96 in. diameter, and as it enters the building the several cars, whatever their length, stand directly over long steel gratings above inverted pyramids of concrete hoppers, into which descend the belts carrying the elevating buckets. These hoppers are each 20 ft. wide, to catch the grain from both tracks, and each is 34 ft. long, so that the nine form almost a continuous hopper the length of the house. These are so much longer than usual in order that the cars need not be uncoupled and spotted, which would take a moment or two of time. Running on tracks attached to brackets in the walls are automatic shovels for unloading the cars, and these shovels are also arranged so that they can be spotted directly to the front of each car door. These shovels work automatically and are put in the proper location by power grips. Running to the bottom of the hoppers are endless rubber composition belts carrying a multitude of small buckets which scoop up the grain and hoist it to the very top of the house, the upper part of each belt running into one of nine steel towers.

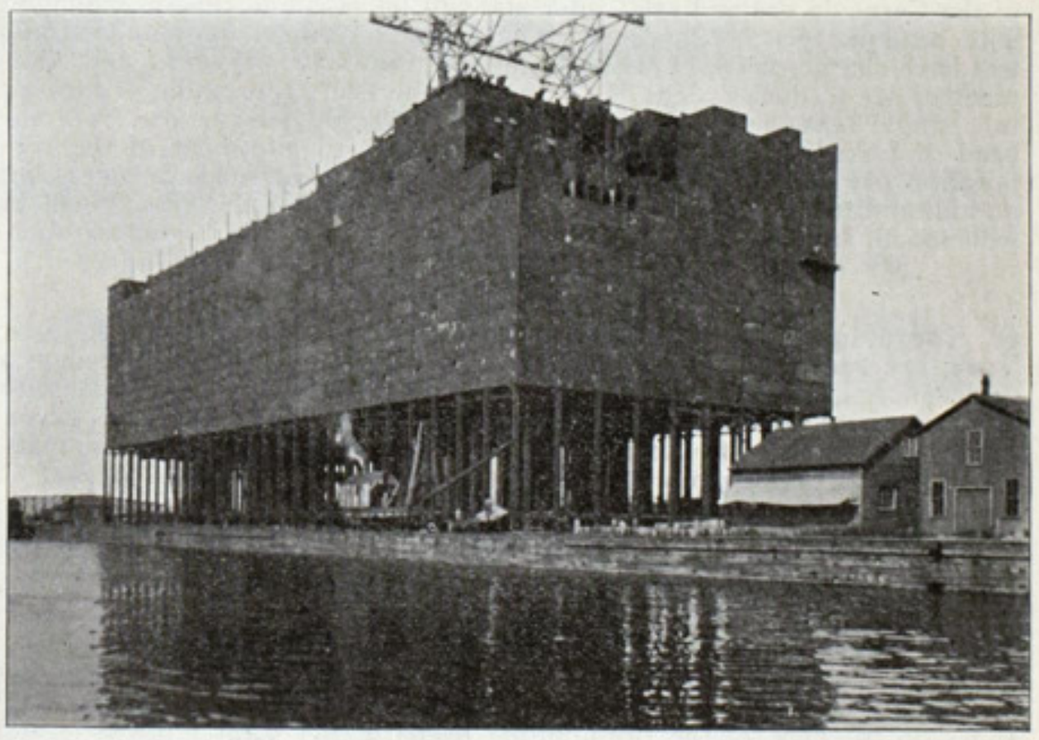
The new steel elevator at West Superior consists of the usual elements—a storage house of bins below, a cupola above containing the machinery and elevating and transferring machinery. The house has many distinctive features that mark it as different from anything yet built. Among these are its square steel bins 85 ft. high with hopper bottoms of steel plate rectangular at top and running to a cone at the outlet underneath, the whole immense weight mounted on steel columns 40 ft. above the ground; the elaboration of the transferring and hoisting apparatus and appliances; the unusual cleaning methods, the systems by which the whole house can be maintained at any operation without closing any other part; the movable shovels for unloading cars, before described; the return to the stationary spout system, and the application of electricity to all machinery drives.

The elevator is built throughout of soft open hearth steel under rigid specifications, and every part is treated to one coat of boiled oil with one-tenth lampblack, all parts difficult of access having two coats. There are 10,000 tons of plates and angles and 400 tons of sheet steel and small angles. The house with its contents of wheat will weigh about 104,000 tons. It is situated on the Superior side of the harbor of Duluth-Superior on a slip a quarter of a mile long and affording 20 ft. of water at the end of railway yards, with room for 1,200 cars. Two tracks run through the house and at the end of the yard is a single track 80-ft. transfer table feeding twelve tracks. The individual yard for this house contains 160 cars.

Beginning at the foundations, the elevator is set upon 4,600 piles each 40 to 50 ft. long and 14 in. through, and each was driven by water jet and heavy steam hammer to refusal. The water jet sets one pile by driving the adjoining one and does not broom the end of the pile. Each pile is capped by heavy timber heads bolted on. On clusters of these piles timber grillage was set, upon which concrete pedestals of a rich mixture of Portland cement bound by iron rods hold the bases of the steel columns, each of which latter weighs five tons. Along the entire length of the structure, on the receiving side, are the concrete receiving hoppers, each surrounded by sheet piling cofferdams. The floor is of heavy cement.

SHOVEL SYSTEM IS MOST INTERESTING.

Above is the main floor, 32 ft. to the base of the bins over it. On this floor are two parallel railway tracks over the receiving hoppers. These hoppers are each 35 ft. long and are covered with the usual steel grating. To add to dispatch of unloading cars there are eighteen large automatic shovels, each hung from a track in the side of the columns and each running freely on its own track. There is one shovel for every car that can be brought into the house at one time. An automatic grip brings a shovel readily and quickly to the door of any car and the unloading is in remarkably rapid time with one man to each shovel. Each line of nine shovels is run by two sets of rope drive, and the utmost ingenuity has been shown in handling the rope through the several shovels and their various pulleys. Indeed, the shovel system and its unique elaboration is one of the many interesting features of this elevator. On the water side of this floor is the cleaning machinery, consisting of eight groups of ma-



chines, five to a group. These machines will scalp, grade and clean the grain at one continuous operation. For reasons that every elevator man will understand the operation of the cleaning machines is among the most important in the entire elevator.

A veritable forest of spouts reaches down from the bottom of the bins toward the floor, for the transferring of grain from one series of bins to another, from the house pockets to the shipping bins, to the cleaners or to any other part of the great house.

Rising from the main floor are the rectangular steel bins, 607 in number, varying in size from a capacity of 12,200 bushels to less than 2,000 bushels. They are 85 ft. high, higher than any elevator bin has ever been made. The pressure of wheat on the sides of bins is so great that it was not considered safe to raise the bins more than 65 to 70 ft. The steel plates forming these bins are in seventeen course of 5 ft. each, and the steel of the two lower courses are 5-16 in. thick, that of the succeeding four are ¼ in. and the remaining eleven are 3-16 in. The bins vary from 16.9 ft. by 13.5 ft. to 6.75 ft. by 4.5 ft. in horizontal section. There is, of course, an immense pressure against the sides of the bins, which have not the circular form to give the strength that is relied upon in all

other steel elevators ever built, so a Z bar is run up the center of each side of each bin. These bars are connected each way by tie bars, spaced 5 ft. apart, one above the other and running to the center of each plate. These tie bars are 5½ by 7-16 in. and hold the plates rigidly. Each corner of each bin is reinforced from bottom to top by angles that are at the bottom 8 by 8 in., tapering to less than half that size at the top. These make a solid riveted beam up the depth of the bin in each interior corner of the great house. Alternate flanges of bin plates are bent inwards to make a rim, which is done in order that the grain may be deflected into an arch, thus taking off some of the weight of the mass of wheat and distributing the pressure throughout the depth of the bin instead of concentrating it at the bottom, as usual. This is a novel and interesting feature and would be almost impossible in any other form of construction. The hopper bottom of each bin is also reinforced by a strong-back of angles that assist in making a lower arch and and strengthen the bins.

Above the bins is the bin floor, next above that the spout, then the scale and then the machinery floor, which is close under the roof. All these are in the cupola of the building, which is itself a high structure and in which so much head room is required that the problem of wind bracing was a difficult one. The bin floor contains little, but the lower ends of the discharging spouts running into bins below. On the spout floor, next above it, are the lower turn heads which direct the grain from the upper series into bins, and a pair of longitudinal belts, each 40 in. wide and running the length of the elevator. They are to transfer grain lengthwise of the house and the two when running 1,000 ft. per minute will transfer 32,000 bushels of grain hourly. They are endless, passing over pulleys, and devices called trippers are placed in each belt for discharging the grain. By these the belt is run in the shape of a U and the grain, which drops from the lip of the U, is caught by a spout inserted in the U and delivered to one side. The belts have no cleats or holding devices of any kind and run full, but do not spill. They are sustained by idlers, spaced at short distances.

On the next floor above are the scales, immense balances holding bins capable of weighing 1,600 bushels of wheat or 2,000 bushels of oats. The upper system of turn heads is on this floor, under the scales. By an ingenious arrangement a man on either this or the floor below can place the turn heads in any desired spout, reaching certain bins.

Above the scales are the garners, into which wheat is first poured when it is elevated into the house. These are large and their girders form the sides of the house and the floor. They empty into the scales. Above them is the machinery floor, on which all the motors for driving the elevating and cleaning legs and elevators are situated.

DISCRIPTION OF THE POWER DISTRIBUTION.

The power distribution in the house is all electric, generated in an outside building by one tandem compound Allis and one cross compound Buckeye engine. A third engine is to be installed for another large dynamo. There are now two 3-phase, 440-volt, alternating current dynamos of Westinghouse make, in addition to the lighting machines. All the three houses of the system are worked from this generation. In the new steel house are these motors: For the car haul into the building, one 100 H.P.; for the receiving and shipping legs, eighteen, 75 H.P.; for the cleaners, shovels and fans, eight, 50 H.P.; for the conveyors, two. 25 H.P.; for the transfer table, one, 20 H.P.; for the cleaner legs and passenger elevator, ten, 15 H.P.; for a conveyor, one, 7.5 H.P.; in all forty-two motors of an indicated horse power of 2,107.5. There is a switchboard in the superintendent's office and each motor has its starting switch near the machine it drives.

The elevator is fireproof, though some of its floors are of wood, asbestos lined. The use of wood was decided upon from the fact that wheat on a steel floor would make walking a difficult fact. The building was recently examined by the insurance underwriters and it is probable that a rate of 50 cents per $100 will be made on grain therein. The rate on the usual wood house is 2 per cent. or more. This elevator full of wheat is worth $3,250,000. The fire protection is furnished by three pumps, 2,500 gallons per minute capacity, which provide for the three elevators and the flour warehouses, the largest in the world, which lie alongside. Smaller direct and triplex pumps are in continuous operation, and a 1,500-gallon Buffalo pump will commence action automatically when any sprinkler head is released. Outside the steel bin walls of the elevator is to be put another skin of galvanized iron, with a space of 6 in. between. This space can be converted into a sheet of water by the opening of discharge pipes along its upper line. This water pouring against a hot metal would be converted into vapor, which will make a more efficient fire curtain than the water itself. The entire outside of the building can thus be protected.

The capacity of this elevator is greater than any in existence. It will hold 3,100,000 bushels; it will receive 500 to 600 carloads a day, an average car holding 800 bushels of wheat. It will grade, scalp and clean 12,200 bushels per hour. It can ship 300,000 bushels a day, with its sixteen marine spouts, and in one draft it can pour 160,000 bushels into a waiting ship, a larger cargo than the average ship will hold. The extreme length of the house is 367.33 ft., its width is 124.33 ft. and its height is 251.5 ft. It makes a capacity in terminal house and storage at the head of the lakes for this road alone of 6,350,000 bushels. The building has been planned with machinery capacity and belt room sufficient so that additional steel tank storage can be placed alongside for 3,000,000 bushels more, all to be operated from this house. This storage room is expected to be built in the near future.

The contract for this elevator was let to the Riter-Conley Mfg. Co. of Pittsburg in March, 1889. A coal dock filled with coal occupied the site. This was torn out and 15,000 tons of coal were removed and the foundations were begun in May, when 23,000 cubic yards of loam were removed. The completion of the house would have been a year sooner, but for the congestion of the steel market. The steel was erected by the Kelley-Atkinson Construction Co. of Chicago. The scales were furnished by the Standard Scale Co. of Pittsburg and the electric appliances and machinery by the Westinghouse Co.

A civil service examination will be held May 7 for the position of inspector of hulls in the steamboat inspection service at Detroit. Persons who desire to compete should apply to the civil service commission, Washington, D. C., for application form 1087.

PENNSYLVANIA STEEL CO. TO BE SOLD.

The board of directors of the Pennsylvania Steel Co. last week adopted the following resolution:

"That the stockholders of the Pennsylvania Steel Co. hereby accept the proposition of John Lowber Welsh to pay $5,000,000 for all the property and assets of the Pennsylvania Steel Co., he agreeing to take over all such property and assets subject to the payment of all indebtedness of the corporation. And the board of directors is instructed to accept said offer and to take such steps as may be advised are necessary to put the sale and transfer into effect."

The plan for providing the company with additional capital and for the retirement of a portion of its bonded debt contemplates an increase of capital from $6,500,000 to $50,000,000. There will be a new Pennsylvania Steel Corporation to acquire all the property of the Pennsylvania and Maryland Steel Cos. It is proposed to issue $16,500,000 preferred shares and $10,750,000 common shares for the issues of which the properties will be conveyed, or the control transferred to the new company, subject to the existing bonded debt; and $9,000,000 in cash will be paid into the treasury of the new company. The remaining shares will remain in the treasury.

The $16,500,000 preferred shares and the $10,750,000 common shares will be used as follows: The shareholders of the Pennsylvania Steel Co. will deposit their shares with the Girard Trust Co. for conversion upon the following basis: The present preferred shares will receive new preferred shares 100 per cent., and new common shares 50 per cent. The present common shares will receive new preferred shares 100 per cent. Ten million dollars preferred shares and $10,000,000 common shares to be issued will be sold to Drexel & Co., Dick Bros. & Co. and Edward B. Smith & Co. for $9,000.000 cash. Out of the money thus provided $2,000,000 will be appropriated for the retirement of so much of the present bonded debt as can be obtained at satisfactory prices.

The significant feature of the purchase of the Pennsylvania Steel Co. by the John Lowber Welsh syndicate is the fact that the syndicate has a strong representation in some of the most important steel and iron concerns in the east. These concerns are the Bethlehem Steel Co. and the Cambria Steel Co. The Pennsylvania Steel Co. recently purchased the entire capital stock of the Spanish-American Iron Co. and became the owners of the iron mines at Daiquiri, province of Santiago de Cuba, and also various other groups of mines in which development has only recently begun. The mines of the Bethlehem Steel Co. are not far from this company's property.

There have been rumors of an intention to embrace these properties under one ownership preliminary to their transfer to the United States Steel Corporation, but Mr. Charles Steele, who has been J. Pierpont Morgan's right-hand man in the formation of the great corporation, says that there is no company or set of companies under consideration for absorption at present.

REGULATING THE CHICAGO RIVER CURRENT.

It will be recalled that a meeting of the special committee of the Lake Carriers' Association having in hand the matter of the current in the Chicago river, due to opening of the drainage canal, was to have met in Philadelphia recently, but the meeting was found to be unnecessary owing to the manner in which Mr. Frank J. Firth of Philadelphia, chairman of the committee, had handled the subject with the secretary of war. In reply to letters which Mr. Firth sent to the secretary of war on the subject he has received the following under date of April 9:

"I have the honor to acknowledge the receipt of your letters of March 18 and April 2, also telegram, concerning the flow of water in the Chicago river. Replying thereto, I beg to inform you that I have this day approved an instrument directing the sanitary district of Chicago to regulate the discharge from the Chicago river into the drainage canal, under war department permit of May 8, 1899, so that the maximum flow through the said river and its south branch shall not exceed 200,000 cu. ft. per minute. Maj. J. H. Willard, corps of engineers, United States army, the local engineer officer, will be instructed to observe and gauge the river at suitable points where the greatest and most dangerous velocities may be expected, and if he finds that the resulting currents are such as to permit an increase in the maximum flow beyond 200,000 cu. ft. per minute without endangering navigation or property, he shall so report to this department, with a view to the consideration of the question of a modification of the above mentioned instrument."

Mr. Firth in response sent the following letter to the secretary of war:

"I am in receipt of your favor of the 9th inst. and thank you, on behalf of the Lake Carriers' Association, for your action in the matter of regulating the maximum flow of water through the Chicago drainage canal and river. We recognize that the regulation is of necessity to a certain extent experimental, and we are therefore gratified to note the instructions given to Maj. Willard, corps of engineers, United States army, Chicago, to observe closely and report to the department the current result of the regulating order, with a view to such consideration and further action by the department as you may find necessary. I will transmit a copy of your letter to Capt. J. G. Keith, the Chicago resident member of our special committee, and ask him to keep in close communication with Maj. Willard."

Arrangements have just been completed by the Pere Marquette Railroad Co. with the secretary of the treasury for changing the names of the entire fleet of Pere Marquette steamers. The four steamers, which have been known so long as F. & P. M. Nos. 2, 3, 4 and 5, will hereafter be called Pere Marquettes Nos. 2, 3, 4 and 5, respectively. The car ferry Pere Marquette will be known as Pere Marquette No. 15; the car ferry Muskegon will be called Pere Marquette No. 16, and the new steel car ferry now being built by the American Ship Building Co. at Cleveland will be christened Pere Marquette No. 17. It is said that the directors finally decided upon this plan of naming the boats in order that the name Pere Marquette might be kept as prominently before the public as possible. It will also simplify the naming of any boats that may come out in the future. The jump from 5 to 15 is made in order that there may be no confusion of the numbers representing the car ferries with those of the line steamers.

GRUSON ROTATING TURRETS.

AN IMMENSE ARMOR PLANT IS BEING ERECTED AT EDDYSTONE FOR THEIR MANUFACTURE.

At Eddystone, thirteen miles out of Philadelphia, an immense armor plant is nearing completion. This plant is practically an extension of the great Krupp works at Magdeburg-Buckaw in Germany. The Fried. Krupp firm owns one-fifth of its stock, and under the direction of the Krupps it will make at Eddystone those coast defenses that are called the Gruson rotating turrets. Very interesting is the story of the plant's origin, of the Krupps' connection with it, and of these wonderful turrets that it will construct.

P. H. Griffin of Buffalo is the president of the Gruson Iron Works, as the Eddystone concern is called. Mr. Griffin has been interested all his life in the manufacture of chilled iron. In his factory at Buffalo he turns out 450 chilled iron car wheels a day, and he has three other factories in the United States, two in Canada and six in Europe. Five months of each year he spends in Europe, looking after his interests there. In 1897 he visited the Krupp works at Magdeburg-Buckaw, where the Gruson turrets are made. He made a study of these turrets, and in August, 1898, he consummated a deal with the Krupps by which he was empowered to make them himself in the United States, the Krupps agreeing to supply him with all the needful information and to send over, if that should be necessary, expert workmen from their shops to start the plant. What attracted Mr. Griffin to the turrets was the fact that they are made of chilled iron.

The Gruson turrets are thick iron things that resemble the backs of turtles. They squat low, and no shot from any ship, as has been proved conclusively, can harm them. They rotate, and they are armed each with two guns that, thanks to their rotation, have a firing radius of 360 degrees. Germany, Italy, Austria, Holland, Belgium, Switzerland, Roumania and Brazil have adopted them. The germinal idea of a rotating turret for defense originated in America. Ruggles Timby of New York patented, in 1843, "a metallic, revolving fort, to be used on land or water and to be revolved by propelling engines located within the same and acting upon suitable mechanism." Ruggles Timby's turret was used on the Monitor during the civil war, and Mr. Timby received $10,000 in royalties for its use.

Gruson, an iron manufacturer of Magdeburg, took up Timby's idea and devoted his life and fortune to perfecting it. He succeeded. But the work left him practically penniless; the incomparable value of his turret was not recognized, and he was just about going to the wall when the Krupps stepped in and bought his plant and secret. His secret was a method of chilling immense plates of cast iron—plates, some of them, 7 ft. thick—so well that they were harder, after the chilling, than hardened steel. Besides this, he had calculated mathematically such a shape for his turtle-back turret that, no matter at what angle a ship should fire on it, the shell could not pierce it, but would be deflected. He had perfected, too, a hundred other ideas tending to the turret's impregnability, and all these, the work of a lifetime, the Krupps bought, and now have handed over to the American firm.

To support the claim that a Gruson turret is impregnable it is pointed out that at Spezzia, Italy, the Italian government made a highly successful test some time since. A plate from one of the great turrets made by the Krupps for the harbor of Spezzia and Taranto was tested. The plate weighed 193,895 lbs. Three shots were fired at it at point-blank range from an Armstrong 100-ton gun. Krupp steel shells, each weighing 2,205 lbs., were used, and the powder charges consisted of 827 lbs. of one-hole, brown prismatic powder. The energy developed on impact amounted to 47,466 foot-tons. Each of these tremendous shells on striking shivered into countless tiny splinters, but the plate stood the test faultlessly, the only effect produced on it being the appearance on its surface of several long abrasions of 2 and 3 in. in depth, and a number of cracks beside, five of which showed themselves on the rear side.

HOW THE TURRET IS OPERATED.

Made of such plates as this—plates running from 2 up to 7 ft. in thickness—a Gruson turret lies low, like the back of a turtle, on the ground, all of it save the turtle-back and the guns being underneath the soil. It is painted, and its guns are painted, the same color as the surrounding country. By an ingenious pivoting arrangement, the idea of Herr Gruson, the portholes are scarcely larger than the guns that protrude from them. Within, in perfect safety, a squad of fifteen men operate the great coast defender. The captain stands in the center, and with two levers aims the guns. When everything is ready he presses an electric button, and the men fire. The range-finder is like a camera obscura. It is a table, and by looking on its surface all the country roundabout can be seen. The table is divided into squares, each representing 100 ft. The squares are numbered, and as a ship passes from one to another of them the man at the finder calls this out. It is possible to aim and fire with perfect accuracy without actually seeing the target at all. Its image on the finder is all that is required.

GREAT WEIGHT OF TURRETS.

Some idea of the turret's enormous weight may be gathered from the following table:

	Weight for 12-in. turrets, lbs.	Weight for 16-in. turrets, lbs.
Chilled-iron cupola	1,677,000	2,850,000
Chilled glaces armor	1,175,000	1,415,000
Cast-iron roller path	75,000	100,500
Substructure (rolled steel)	176,000	340,500
Live rollers	143,000	267,500
Accumulators and weights	210,000	450,000
Revolving mechanism	17,400	24,500
Mechanism for operating accumulators	18,000	15,000
Hydraulic rammers	2,500	3,100
Hydraulic brakes	2,000	6,000
Turnscale mechanism	1,200	1,300
Ammunition hoists	15,500	21,500
Crane-track in turret	800	1,200
Hydraulic piping	4,500	7,800
Steam boilers (two)	30,000	41,000
Gun carriages for two guns	135,000	250,000
General accessories	2,800	4,500
Total weight in pounds	3,685,700	5,799,400
Total weight in gross tons	1,640	2,589

The best coast defense that the United States at present has is the gun on a disappearing carriage. The disadvantage of this defense is in the fact that the gunners are not protected. Shrapnel, filled with thousands of small bullets, can now be timed to burst at any desired point, and nothing is easier than for a ship to send its shrapnel over the parapets of forts, to burst above the gunners' heads. Two things heretofore have precluded the purchase by the United States of Gruson turrets. One was the fact that they were made abroad, and the other was their great cost. The cost of those to be made here will not be great, it is claimed, for charcoal-iron, the chief material used in their construction, is cheaper and better in the United States than in any other country in the world. The United States is counted upon to take up these turrets.

EXTENSIVE WORKS AT EDDYSTONE.

The superintendent of the Gruson Iron Works is David Townsend of Philadelphia, a son-in-law of James Moore, whose Bush Hill Iron Works were located on the site of the new Spring Garden street mint. From 1876 to 1895 Mr. Townsend was with Mr. Moore, and in 1895 he established for William Wharton, Jr., & Co. the Philadelphia Roll & Machine Co. as a department of their works. In 1898 he went abroad for Mr. Griffin to look into the manufacture of Gruson turrets, which he now understands perfectly. The Gruson Iron Works at Eddystone takes in 185 acres of ground, on which eight buildings have thus far been erected. There are three railroads to ship over, and there is a frontage to the works of 1,000 ft. on the channel side of the Delaware. Two more buildings are still to go up—an armor plate foundry 800 by 300 ft. in size, and an armor plate machine shop 600 by 200 ft. In May the works will be started, and they will eventually employ, when running full, some 2,000 men. A model of a 12-in. gun Gruson turret will be exhibited by the company at the Buffalo fair.—Philadelphia Record.

LAUNCH OF BATTLESHIP DUNCAN.

The first class battleship Duncan was launched at Blackwell by the Thames Iron Works, Ship Building & Engineering Co., last week. She is 405 ft. in length by 75½ ft. in breadth and is to have a displacement of 14,000 tons on a draught of 26½ ft. Some speeches were made at the launching which are of considerable interest because they refer to the man who is probably the foremost of all naval constructors—Sir William White. Mr. A. F. Hills, the chairman of the company, in the course of a long speech said:

"We have built for the British government now for more than forty years. I wish to do honor to the genius—because I think it amounts to genius—of the man who designed the Duncan, Sir Wm. White. How much we owe to the devotion, to the ability, and to the professional skill of Sir Wm. White it is not for this generation to say. You see in the penny and the half-penny papers strange stories of the decadence of the British empire, of British commerce, and of the English fleet. I am here today to tell you that that is all nonsense. There was never a time in the history of the English fleet when it was so powerful, so well equipped, or so well designed as it is at the present moment, and a great deal of that—in fact, the main part of it— is due to Sir Wm. White, who honors us with his presence today. And I think we can take a little credit to ourselves too. If you look down the line of models in this room you will see that the Duncan is like the Japanese battleship Shikishima; she was almost a facsimile of that vessel. The Duncan is 800 tons less in weight, as she carries less guns and armor. I think that if these two ships, the Shikishima and the Duncan, came at any time to hammer and tongs, they would make a good match of it to the bitter end. We built the Imperial Japanese battleship Shikishima in thirty months. That battleship was 15,000 tons displacement, or 800 tons larger than the Duncan. We designed her, we built her, we armored her, we armed her, we put her through her official trials, and we delivered her in thirty months. The Albion we commenced six months before the Shikishima, and now twelve months after the Shikishima, she is not finished yet, and many people are asking what the reason is that the Albion should take so much longer to build than the Japanese ship. Let me add that the two ships, the Duncan and the Cornwallis, will take three and a half years to build, as compared with the thirty months that the Shikishima took. My answer to you is this: The reason is that the contractors are dealt with differently by the admiralty from what they were dealt with by the Japanese government. We are just as able to build for the British as for the Japanese government, and much more eager to do so; we are full of true patriotism, and we would desire to build as speedily for the British admiralty as for any foreign government. I have had the advantage of placing before the admiralty my views as to the obstacles which now stand in the way, not introduced by any individual, but by that system not so much of red tape as want of centralization, which involves difficulties and delays which prevent the rapid completion of a ship. If the admiralty were to extend the same treatment to us as the Japanese government did in the case of the Shikishima, we could give them just as satisfactory results."

Sir William White, after appropriate compliments to Mr. Hills, replied: "There are some points in Mr. Hills' speech to which I might refer, and I should not be found to be absolutely in agreement with him; but this is not the occasion for controversy, and, what is more, Mr. Hills, who has the courage of his opinions, and who speaks his mind, is a man one must honor. There is one small fact, however, to which I must refer. Mr. Hills has done us the credit of assuming that the Duncan followed the design of the Shikishima. I want to point out that years before there was any Shikishima there was a Majestic class in the navy. I think that I am correct in saying that our friends in the Japanese admiralty, looking about the world for that type of battleship which they desired to conform to most closely, selected the Majestic class as being that type; and with all respect for the work, that has been done here, I would venture to point out that battleship design did not begin with the Shikishima."

STEEL CORPORATION'S ORE POSSESSIONS.

According to calculations made in Duluth the United States Steel Corporation holds nearly 70 per cent. of the ore mines of the Lake Superior region on the basis of last year's production. The great corporation is still engaged in buying mines and closing options. The largest option was that upon the large Cleveland-Cliffs property but this as will be noted elsewhere in this issue is off.

The steel corporation is also said to have options on Brotherton and Sunday Lake mines for $1,000,000 and on three outside Mesabi properties, Roberts, Hale and Kanawha, for a smaller sum. It has options also on other old properties on the Gogebic and Menominee ranges and has a $500,000 option in Canada. Following is a summary, given for what it is worth, of properties controlled by the corporation. The table shows interests from which the mines were secured and their product in 1900:

	Tons.
MESABI RANGE.	
Adams (Rockefeller)	777,346
Aetna	.....
Auburn (Minnesota Iron)	263,692
Biwabik, one-fourth (National Steel)	235,000
Canton (Minnesota Iron)	.....
Clark (Steel & Wire)	63,071
Cloquet (Rockefeller)	.....
Day (Rockefeller)	.....
Duluth (Rockefeller)	128,587
Fayal (Minnesota Iron)	1,252,504
Genoa (Minnesota Iron)	253,651
Lake Superior (Rockefeller)	284,023
Mahoning, one-fourth (National Steel)	228,000
Minnewas (Rockefeller)	.....
Mountain Iron (Carnegie)	1,001,324
Norman (Carnegie)	.....
Ohio (Carnegie)	172,597
Oliver (Carnegie)	244,876
Pillsbury (Rockefeller)	101,032
Sauntry (Steel & Wire)	681,560
Sellers (Rockefeller)	56,280
Spruce (Rockefeller)	101,675
Union, one-half (Steel Hoop)	4,149
VERMILLION RANGE.	
Minnesota (Minnesota Iron Co.)	325,020
Chandler (Minnesota Iron Co.)	644,801
Pioneer (Carnegie)	450,794
Savoy (Carnegie)	175,116
Zenith (Carnegie)	60,089
GOGEBIC RANGE.	
Atlantic (Steel & Wire)	135,955
Aurora (Carnegie)	193,111
Norrie (Carnegie)	666,389
Pabst (Carnegie)	239,242
Tilden (Carnegie)	481,909
MARQUETTE RANGE.	
Hartford (Carnegie)	.....
Lake Superior (Carnegie)	709,143
Negaunee (Steel & Wire)	126,829
Regent (Carnegie)	398,298
Winthrop (National Steel)	148,945
MENOMINEE RANGE.	
Aragon (direct purchase)	404,645
Chapin (National Steel)	926,937
Columbia (Carnegie)	97,531
Cuff (Steel & Wire)	38,209
Gundy (Federal Steel)	141,148
Dober (Carnegie)	49,203
Hilltop (Steel & Wire)	6,410
Mansfield (Carnegie)	90,155
Pewabic, one-half (Carnegie)	187,022
Riverton (Carnegie)	71,004
Total for United States Steel Corporation	12,724,979

AROUND THE GREAT LAKES.

Capt. John Ivers, who sailed the steamer Merida last season, will command the new steamer D. M. Whitney.

An Ottawa dispatch again makes the announcement that the Welland canal will be opened April 22 and other canals of the Dominion May 1.

The Graham & Morton Transportation Co. of Chicago has purchased the steamer City of Louisville back from the underwriters for $6,000. The latter recently paid a fire loss of $40,000 on the craft.

The John Schroeder Lumber Co. of Milwaukee has bought the steamer A. C. VanRaalt from Charles Leihy of Bayfield for $12,000. Frost & Sprague of Cheboygan have bought the tug Merrill from the Milwaukee tug line.

The steel tug Ewig was launched at Johnston Bros. ship yard at Ferrysburg, Mich., a few days ago. She is owned by Ewig & Sons of Port Washington and is built for fishing purposes. Her length is 80 ft., beam 16 ft. and depth 8½ ft.; the cost was $15,000.

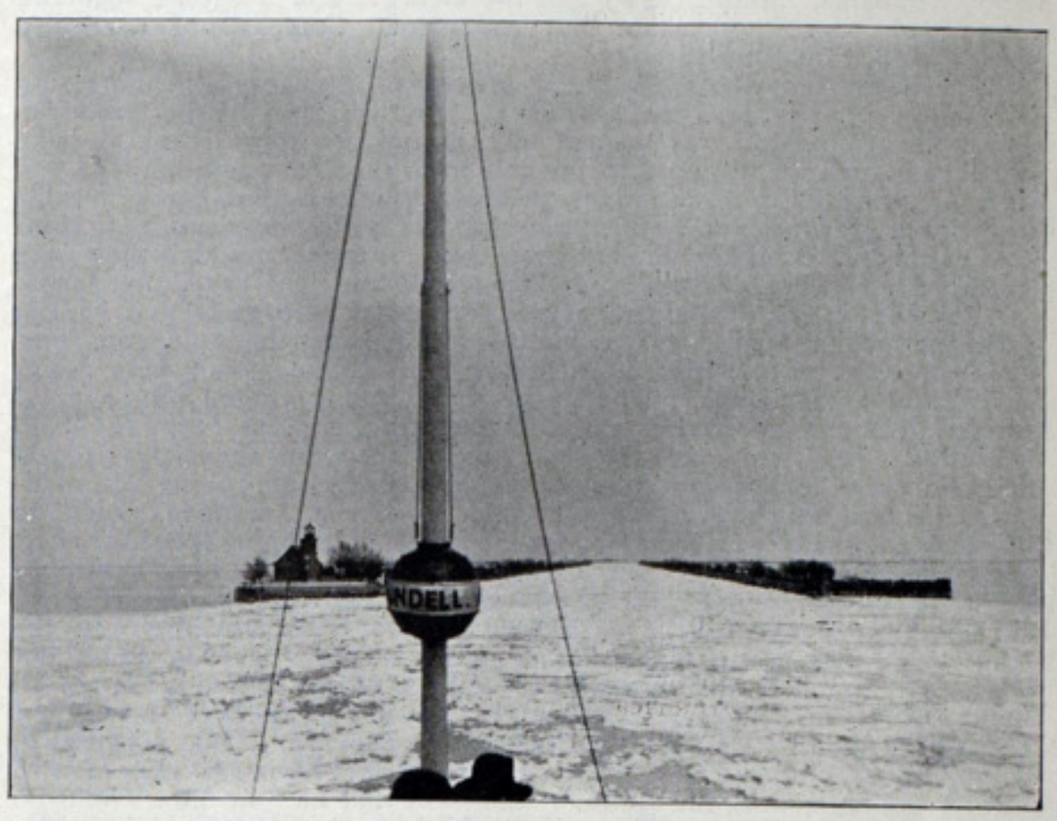
Capt. J. M. Fields, who introduced on a large number of lake vessels last season the Fields reversible dial compass and course corrector, has returned from California and will this season engage in the work of correcting compasses. His headquarters will be at the Hotel Bethel.

W. J. Farasey, 107-115 River street, Cleveland, representing the Lackawanna Green Bay line of freighters, announces that his warehouses are now open and that the first boat of the line will leave Cleveland about April 22 for Mackinaw, St. Ignace, Escanaba, Menominee, Marinette, Green Bay and points beyond in northern Michigan and Wisconsin. Mr. Farasey has been appointed agent at Cleveland of the Rutland Transit Co. (Ogdensburg line). The first boat of this line will leave Cleveland about April 22.

BLOCKED BY FLOATING ICE.

In some years the lakes below the St. Mary's river are almost entirely free of ice about the middle of April. Then again the first of May finds the connecting rivers between Lakes Huron and Erie almost completely blocked by floating and grounded ice. A condition now existing at head of Lake St. Clair is pictured in the accompanying engraving. Vessels often meet with rough experiences in such places.

The initial trip of the steamer Arundel on Sunday last out of Detroit was attended with considerable interest. The steamer had 400 passengers on board and was resolved upon the experiment of forcing itself through



the St. Clair ship canal. The vessel reached the canal just at the time that the big break in the ice came. Indeed when within 200 ft. of the canal she was carried back by the weight of the ice and the force of the current which was estimated to be about 10 miles an hour. The angles of piling at the upper end of the canal shot the ice into the center of the cut and it fairly boomed as it came through. It was heavy chunk, pack ice, some of it 4 and 5 ft. thick. The Arundel could make no headway against it and she drifted back out into the lake. A second attempt was made an hour later, but without success.

OBSTRUCTIONS CHARGED TO LIGHT-HOUSE OFFICIALS.

Editor Marine Review: Through the columns of your paper I desire to protest against the United States light-house department placing any more dangerous obstructions to navigation in Lake St. Clair. It has been the custom for years to drive clusters of piles on which to establish lights in this shallow lake during the season of navigation. Every winter these piles are pushed over or cut off by the ice, in either case leaving just below the surface a hidden danger to any vessel, large or small, chancing to strike them.

In addition to these dangers to navigation, some two or three years ago the light-house department planted six massive timber cribs, filled with stone, three on each side of the 20-ft. channel, on which they erected Pintsch gas lights. The heavy ice has carried off the top of every crib, leaving just below the surface a dangerous menace to navigation. Several vessels have, I believe, struck these obstructions, and at least one yacht has been sunk, and should a large steamer take a sheer and run upon one of these sunken cribs, it would surely result in great damage to the vessel and perhaps sink her.

It seems strange that while the government is spending millions of dollars to remove obstructions to navigation from other channels along the chain of lakes, a part of this money should be spent to place other dangers. Steps should be taken at once by the proper officials to remove these obstructions.

RICHARD P. JOY.

Detroit, April 17, 1901.

DETOUR LIGHT—DANGEROUS CRIBS IN LAKE ST. CLAIR.

Capt. George P. McKay, chairman of the committee on aids to navigation of the Lake Carriers' Association, has received the following letter from Com. J. C. Wilson, inspector of the eleventh light-house district:

"I am in receipt of your communication of the 13th inst. in regard to changing the characteristic of the Detour fog signal so that it will indicate the absence of fog in the river, etc. I shall look into the matter further and if I consider it practicable, shall recommend to the light-house board that the characteristic of this fog signal be changed, and when such change is authorized the usual notice to mariners will be issued.

"Referring to the request that the remains of the crib at the head of Russell island and those in Lake St. Clair be removed, I have to state in regard to the one at the head of Russell island that it has been recommended to the light-house board that as soon as practicable after the opening of navigation the old light be re-established on this point on a pile structure driven as close as possible to the remains of the old crib. In regard to the obstructions in the 20-ft. channel I have reported to the board upon the danger of these cribs. Before the close of navigation last year No. 1 was rebuilt with the idea of determining with certainty whether or not it would stand through the winter. Should it have stood the pressure of ice all of the cribs would have been reconstructed. The engineer of the district is now absent on duty, and as soon as he returns I intend to take this matter up for further recommendation to the board."

TEN YEARS' NAVAL CONSTRUCTION IN UNITED STATES.

At the recent annual meeting of the Institution of Naval Architects in London Prof. J. H. Biles read a paper upon the subject "Ten Years' Naval Construction in the United States." The author stated that most of the information given in his paper was obtained from official documents published by the navy department of the United States which corresponds with the British admiralty. All interested in warships and their construction owed a debt of gratitude to the generous manner in which this department of the government gives information to the people. There was nothing in Prof. Biles' paper which is not known to readers of the Review. He gave descriptions of the Indiana, Iowa, Kentucky, Alabama, Maine (new) and the Georgia and Virginia, spending considerable time upon armor and armament. Comparisons were also given with certain English types.

The discussion which the paper provoked, reported in Engineering of London, is of interest as showing the English view of the American navy. The discussion was opened by Admiral Sir John Hopkins, who said that he rose in response to the call from the chair, although he had not come prepared to discuss the paper, which he considered an admirable production. It must not be forgotten that the latest American battleships were of somewhat higher tonnage than some of those to which they were compared. He believed that Sir William White had asked for larger size, but the outcry raised against the demand was so great that he had to go back to former figures. It had been stated that the Americans confine themselves to one type of battleship, not building what were designated second-class ships. There was, it might be pointed out, a great tactical advantage in having ships all the same size, as they would all turn alike. The Americans, however, did not confine themselves to set dimensions, but as time progressed they were always improving and making revision as much as thought necessary. If the Americans could do this, why could not we? They had gone up to 19 knots in speed for their battleships, and would go one better than this. Their distribution of armor was up to date, so far as the improved ideas of naval officers went. In visiting our dock yards he was shown very fine vessels belonging to the royal navy; they were impressive in many respects, but he could not forget that they had soft ends, and that the armored belt did not go all round. Now the Americans seemed to get armor all over their ships. It was difficult to know how they did it, but they did. They armored to the main deck, and this he considered was where armor was most wanted —a fact emphasized by the author's statement that an 8-in. gun would go through our 6-in. armor. There were objections to the placing of guns superposed in the same turret. Each gunner wants to get his shot off. and can do so if he acts independently, but if both the above and below guns must move simultaneously he thought there might be a division of opinion, and that would lead to difficulty. The small draught of the American ships was another respect in which they had an advantage. This was very strongly emphasized in one case, in which one of our vessels tried to pass through the Suez canal. The coal had to be taken out of the vessel to lighten her draught, and even then she stuck on a sand bank, although she providentially got off again. Admiral Hopkins made reference to the arrangement of screws. The Americans thought that three propellers were advisable, and he would ask whether we ought not to add another screw to one of our twin screw ships just for trial. There were, of course, disadvantages in connection with the arrangement. The admirals and captains did not altogether like it, because there was another force to control from the bridge and they had their hands pretty full already. A good deal was being said about boilers at the present time, and he would point out that although the Americans had adopted the water tube boiler, one did not see the Belleville boiler in their ships. They were pretty shrewd engineers in the United States, and if they left anything out of a ship it might safely be concluded there was a reason for the course. For his own part he considered the royal navy needed the best thing in boilers, but he did not approve of one particular thing being pitched wholesale upon the fleet until it was found out it was the best of its class. He thought the keels for docking purposes described by the author were good. The Americans have had some experience in this respect, for they had had an accident with one of their ships in Southampton. They had settled the matter by dismissing the captain; fortunately for captains, we look to constructors in this matter in England.

Admiral Fitzgerald had been in San Francisco, and saw over some of the American ships. He learnt on that occasion from American naval officers that they were averse to the superposed turret principle, as they could make nothing of the shooting with it, in fact, the officers were dead against the arrangement. The 8-in. gun could not fire ahead without knocking everyone out of the 12-in. turret. In the American designs the 8-in. guns were good, but he would ask what had been left out of the ship to make room for them; something must have been omitted. In regard to the small vessels, if the American torpedo boats of 144 tons did 30 knots, it really seemed a better performance than had been achieved elsewhere.

In replying to the discussion Prof. Biles said there was very little criticism that needed reply. Admiral Fitzgerald had asked what was left out to make room for the 8-in. guns; that it was impossible to say, for the simple reason that we do not know what is in the British ships. If the admiralty would give the public a little more information he could reply to the question. He would, however, suggest to Admiral Fitzgerald that he should go to the admiralty and ask them to tell him why the Americans had managed to get in these 8-in. guns, and he would then perhaps find what had been left out. He thought, however, that Admiral Fitzgerald had not appreciated that the tonnage in the English and the American ships respectively was not the same. They managed to get in more tonnage from a given sized ship.

Williamson Bros., engineers of Philadelphia, have been awarded the contract for large evaporating plants to be fitted on the two mammoth steamships building for the Great Northern Steamship Co., at the works of the Eastern Ship Building Co., New London, Conn. The evaporating system on these vessels is very elaborate and has been designed by the Eastern Ship Building Co. to give the maximum economy obtainable at the present day for marine installation. Each ship is fitted with four evaporators, which when working quadruple effect will have an average output of 80 tons per day. The evaporator can work single, double, triple and quadruple effect. Feed heaters, distillers and filters are in duplicate.

SKETCH OF CHARLES M. SCHWAB

Charles M. Schwab was born at Williamsburg, Blair county, Pennsylvania, Feb. 18, 1862. His ancestry is German. His father was a woolen manufacturer at Williamsburg. In 1872 the family moved to a farm at Loretto, Cambria county, where Charles received his education, graduating from St. Francis college at that place in 1880, in the meantime, when fifteen years old, driving a mail wagon from Loretto to Cresson. We next hear of him as a clerk in 1880 in a grocery store at Braddock, where the Edgar Thomson Steel Works are located. After six months' service in this capacity, at a salary of $10 a month and his board, he entered the service of the Edgar Thomson Steel Co., Ltd., at Braddock, as a stake driver, at a salary of $30 a month. He next entered the drafting office, in which he made rapid progress. He was steadily promoted from one responsible position to another. Capt. William R. Jones was the general superintendent of the company's Bessemer plant and furnaces, and in him young Mr. Schwab found an appreciative and active friend. Those were the days of small things at Braddock. The Bessemer department had made its first blow on Aug. 26, 1875, and the mill had rolled its first rail on Sept. 1 of the same year, the daily capacity of the plant in 1880 being 450 gross tons of ingots and 375 gross tons of rails, both double turn. Only one of the Edgar Thomson furnaces had been built prior to 1880. Mr. Schwab soon became Capt. Jones' assistant at the entire Edgar Thomson plant, supervising the building of many big furnaces and helping in all the engineering problems of the company, including the increase in the capacity of the rail mill. Mr. Schwab says of these days: "When I first went to work for Mr. Carnegie I had over me an impetuous, hustling man. It was necessary for me to be up to the top notch to give satisfaction. I worked faster than I otherwise would have done, and to him I attribute the impetus that I acquired. My whole object in life then was to show him my worth and to prove it. I thought and dreamed of nothing else but the steel works." The "impetuous, hustling man" was Capt. Jones.

After entering the service of the Edgar Thomson Steel Co. Mr. Schwab devoted himself assiduously to mastering all the details of the steel industry. He says of this period of his life: "In my own house I rigged up a laboratory and studied chemistry in the evenings, determined that there should be nothing in the manufacture of steel that I would not know. Although I had received no technical education I made myself master of chemistry and of the laboratory, which proved of lasting value."

In 1888 Mr. Schwab was transferred to the Homestead Steel Works, succeeding Julian Kennedy as general superintendent. Capt. Jones died Sept. 28, 1889, at Pittsburg, from burns received on the 26th by the bursting of furnace C of the Edgar Thomson plant. He was immediately succeeded as general superintendent by Mr. Schwab, who was then in his twenty-eighth year. This position Mr. Schwab filled most creditably for the next three years.

The Edgar Thomson Steel Co. had been succeeded as early as 1882 by Carnegie Brothers & Co., Ltd., and about 1885 a closely affiliated firm, Carnegie, Phipps & Co., Ltd., succeeded to the ownership of the Homestead Steel Works, which had been completed in 1881 by the Pittsburg Bessemer Steel Co., Ltd., and which had made their first blow on March 19 of that year. Carnegie Brothers & Co. and Carnegie, Phipps & Co., prior to their entrance into the steel business, had operated respectively the Upper and Lower Union Mills at Pittsburg, for the manufacture of various rolled iron specialties, and Carnegie Brothers & Co. had also owned the two Lucy furnaces at Pittsburg. In 1890 Carnegie Bros. & Co. purchased the Duquesne Steel Works, which had been operated by the Allegheny Bessemer Steel Co. and had made their first blow in February, 1889, and their first steel rail in March of the same year. In 1892 Carnegie Bros. & Co., Carnegie, Phipps & Co. and the Keystone Bridge Co. were consolidated into the Carnegie Steel Co., Ltd. The Keystone Bridge Co. was a Carnegie enterprise. In the same year the Homestead strike occurred, and soon afterwards Mr. Schwab was again transferred from the Edgar Thomson works to the Homestead works as general superintendent. In 1897 he became the president of the Carnegie Steel Co., Ltd., and in 1900 of the Carnegie Co., and these positions he has held down to the present time. He now becomes the president of the United States Steel Corporation, with a capital of $1,100,000,000.

Mr. Schwab occupies today the most prominent and the most responsible position in connection with the world's industrial development that has ever been held by any man. The conditions, indeed, have never before existed which would call for the display of technical skill and executive ability on so large a scale as is now demanded of Mr. Schwab, the head of the United States Steel Corporation. The world has never known such a vast aggregation of capital and producing capacity as this gigantic enterprise represents. It is a consolidation of nearly a dozen mining, manufacturing and transportation enterprises, the magnitude of any one of which would not have been dreamed of a few years ago. At the head of this great consolidation is placed a comparatively young man, not yet forty years old. That Mr. Schwab will in every way meet the expectations of his business associates who have entrusted him with such immense responsibility is the confident belief of all who know the man and have watched his remarkable career.—Bulletin Iron & Steel Association.

A new and important line of steamers has just been established to connect New York directly with South Africa and India, to be known as the Hansa line. The purpose of the establishment of the new line is to take part in the rapidly growing trade with the east. The Hansa line has for the past thirty years been engaged in the carrying trade from Bremen, Hamburg and London to East Indian ports. The New York agents are the shipping house of Funch, Edye & Co., Produce Exchange building. The steamers will call at Cape Town, East London, Mossel bay, Delagoa bay, Port Elizabeth, Port Natal and Port Alfred, South Africa, and Calcutta, India, stopping alternately at Colombo (Ceylon) and Madras, carrying cargo for all transhipping ports. The first steamer, the Neidenfels, will sail June 5, followed by the Argenfels on July 5 and the Hohenfels August 5, the names of the other steamers being Lowenburg, Ehrenfels, Wildenfels, Dannenfels and Scharzfels. The steamers are large, powerful and new, being especially built for this service, some of the boats not being delivered yet. They are expected to reach Cape Town in twenty-six days. The steamers are practically alike, 416 ft. long, have a cargo capacity of over 400,000 cu. ft., or 8,000 tons dead weight, with limited passenger space.

COPPER SMELTING IN LAKE SUPERIOR.

A RAPID HISTORICAL SKETCH OF THE DEVELOPMENT OF SMELTING WORKS —NO PREVIOUS RECORD OF THE FIRST ATTEMPT TO SMELT COPPER.

At the recent meeting of the Lake Superior Mining Institute Supt. James B. Cooper of the Calumet & Hecla Smelting Works read a paper upon the subject of "Copper Smelting in Lake Superior," which is interesting for the historical information it contains. In part he said:

Of the first two attempts to smelt (not refine) copper in the Lake district I have found no published record. These were both made in Keweenaw county and Mr. John Senter has given me the following data regarding them: In 1846, the year Mr. Senter came to Eagle river, a furnace was built on the Gratiot river, a short distance west of the present main road. Prof. James T. Hodge built and ran this furnace two very short campaigns. The selected rock, estimated to contain at least 20 per cent. copper, was the material smelted and the net result of the second run of this furnace was 3-5 per cent. copper. No further smelting was attempted after this disappointing result. The second furnace was built (probably in 1847) by the Suffolk Mining Co. to smelt gray ore of copper. This furnace was located about seven miles southeast of Eagle river. This ore was said to be so high in iron, and I surmise so low in copper, that it was impossible to smelt it in this furnace. Mr. Senter fixes the date of this furnace by his having attended its sale in November, 1848. In 1849 the Ohio and Isle Royale Mining Co. built a furnace on Isle Royale which was never put in blast. The product of the lake copper mines had to be shipped to smelting works already established in eastern states. Until late in 1848 probably all the lake copper was smelted by two works—the Revere Copper Works of Boston and the Baltimore (Md.) Works. During these years practically all the product of the lake copper mines consisted of mass and "kiln" copper, as the calcined barrel work was called.

The mass was an entirely new proposition to the smelters as the entire world's product of copper, with small exceptions, had previously been made from the ores of copper. All refining furnaces had the small side door openings only for charging the ores or pigs of copper. At the Baltimore works a large side door opening was made and the masses were dragged into the furnace and through a door on the opposite side to a windlass. The larger door was bricked up after the charging of the furnace. The inevitable result of this method of charging the mass copper was serious damage to the furnace hearths, though they were protected as much as possible with ore and wooden skids.

ASKED $80 A TON FOR SMELTING COPPER.

In 1848 Dr. C. G. Hussey of Pittsburg, one of the directors of the Cliff Mining Co., went to the Revere works to make arrangements for the smelting of their product. It is said the price asked was $80 per ton for masses. This rate was so high that Hussey & Howe of Pittsburg decided to build a smelting works. Their first experiment seems to have been made with the object of reducing masses to sizes small enough to charge easily into an ordinary side door refining furnace. They placed the mass in an ordinary "cannon" furnace of the Fort Pitt foundry of Pittsburg, having first removed the arch or roof. This arch was then rebuilt and the copper tapped into sand beds. The slow heating and melting of this mass evidently made an excessive quantity of slag high in copper. It is also said they suspended a mass by chains in a blast furnace and attempted to melt it. Result, broken chain and a demolished furnace. However, in 1848, Hussey & Howe built a reverberatory refining furnace with a movable roof or cover; this cover being a little larger than the charging hole in the arch of the furnace. This became the universal method at all works smelting lake copper. In 1850 J. G. Hussey & Co. built a copper smelting works at Cleveland. They evidently expected to smelt all the copper they could secure, but in the competition with the Detroit and Portage Lake works were not successful. Up to the time of closing this works in 1867 they had smelted very little except the product of the Cliff and National mines, in which Hussey, Howe & Co. were heavily interested.

John R. Grout, the originator of the Detroit works, had been in the lake copper district, as stated in Mr. Pope's paper (see Marine Review, March 28), spending the winter of 1846-7 near the head of Torch lake; he decided that Detroit was the proper location for a smelting works for lake copper. Like the others he tried the experiment of smelting rich rock direct in a cupola. This trial was made in the small iron cupola of the Smith foundry at Birmingham, Oakland county, Mich., where the old inhabitants still remember the characteristic red color of the slag from the amygdaloid rock. Mr. Grout went to Waterbury, Conn., then, as now, one of the great copper consuming cities of the United States, and four of the largest brass manufacturing companies furnished the capital necessary to build a works consisting of one refining furnace and one cupola for reduction of the slags. These brass companies had had serious trouble to buy copper that was even in quality and equal to their requirements in alloys or in sheet copper where great tensile strength and elasticity were demanded. The principal object of these companies in starting the works was to secure a brand of copper on which they could always depend. This smelting company was called the Waterbury & Detroit Copper Co. and the Detroit works was completed and a small quantity (about 150 tons) of copper was refined in the fall of 1850. Here, on May 10, 1851, my father, James R. Cooper, began work and is now closing his fiftieth year of continuous refining of copper. In 1860 the Portage Lake Smelting Works was built directly opposite Houghton under the supervision of the Messrs. Williams. At this works they began refining copper early in 1861. It was well patronized by the local mines. The product of the Calumet & Hecla mines was sent to this works. They built one stack on the hill side back of the works and four of the refining furnaces were connected to this by an underground flue.

FIRST CONSOLIDATION OF COPPER WORKS.

In July, 1867, the Portage Lake Works with its better central location in the mining district, and the Detroit works, with its prestige as to brand of copper, were consolidated as the Detroit & Lake Superior Copper Co., with Mr. Grout as general manager. My father came to Houghton at this time as superintendent and remained one year, returning to the Houghton works as superintendent in October, 1873, and at the death of Mr. Grout in 1881, succeeded him as general manager. Between 1860-67 two small works were built. One at Lac-La-Belle, Keweenaw county, by one of the Messrs. Williams. The exact dates of the building, starting and closing down of these works I have not yet secured. The second works of this period was built by a Major Pont Alba at Ontonagon, and from about 1863 to 1867 was in commission. From 1867 to 1887 the D. & L. S. C. Co. refined the entire product of lake copper except a small amount smelted by the Houghton rolling mills (the Lake Superior Native Copper Works), whose one refining plant and cupola were put in commission in 1882. The mineral smelted at this works was almost entirely from small mines controlled by the owners of the rolling mills. In 1886 the Calumet & Hecla smelting works at South Lake Linden, owned jointly by the Detroit & Lake Superior Copper Co. and the Calumet & Hecla Mining Co., was built and smelting at this works began June 1, 1887. The Detroit works were closed finally in January, 1887. In 1888, the Dollar Bay Smelting Works were built by the Tamarack-Osceola Manufacturing Co. and smelted copper of the Tamarack, Osceola and other mines controlled by the same management. These were consolidated with the Houghton works of the D. & L. S. Copper Co. in August, 1890, as the Lake Superior Smelting Co. In 1891 the Calumet & Hecla Co. built the Buffalo Smelting Works, where, since 1892, a large part of the C. & H. product has been smelted. In May, 1898, the Tamarack & Osceola Mining Co. bought the Lake Superior Smelting Co.'s works, thus, like the Calumet & Hecla Mining Co., acquiring their own smelting works, but continuing to do custom smelting for other mines of the district. In this same month of May, 1898, the Quincy Mining Co. began the erection of their own smelting works on the stamp sands of the old Pewabic mill. J. R. Cooper supervised the construction of the Quincy works and continues in charge. Smelting was begun Dec. 1, 1898.

REPUTATION OF THE LAKE BRAND OF COPPER.

This completes a hasty sketch of the various works to date. The continuation of the control of the refining of lake copper by the management of the old Waterbury and Detroit companies is truly the survival of the fittest and the reputation of the "lake" brand of copper was made by them. There is no doubt that the lake copper carefully refined is the only "best" copper. The peculiarly tough quality which is characteristic of the native copper is retained to a great degree in the refined copper. From the very beginning at the Detroit works to the present time this copper has been refined by the best known methods to retain in the copper all the good qualities possible. In the comparatively recent years the increasing use of copper for electrical purposes has added a new and most severe requirement as the copper must now be refined so as to get the highest conductivity possible. The progress toward better and more even refinement has been continuous, the variations in "set" now being allowed being very much less than formerly.

During this fifty years the refining of copper has passed from an imperfect process to an exact science. For many purposes the lake copper cannot be successfully replaced by the electrolytic, its nearest competitor. For example, cartridge metal, which demands a brass of great tenacity and elasticity. I doubt if this brass can be made from any other brand than lake and always be equal to the present government requirements; but for this very reason, better and more even refining will always be demanded of the lake copper, as it has been in the past, for the manufacturer will use lake for his best work where the tests demanded are unusually high.

POSITIONS ON THE NAVAL REGISTER.

Of special interest to officers of the navy is an order issued this week by Secretary Long announcing their relative positions on the naval register. The order was necessary because of the provision in the last naval appropriation law directing that the advancement of officers of the navy and marine corps for service rendered during the war with Spain should not interfere with the regular promotion of officers otherwise entitled to promotion. The department has interpreted the law to mean that an officer who has been advanced by numbers for services rendered during the war with Spain is not to be regarded as additional to the number allowed by law in his grade until he is promoted to a higher grade than the one in which he was when he received advancement. The department holds that the purpose of the law is not to hasten the promotion of officers advanced for war service, but to prevent such advancements from interfering with the promotion of others.

The special order shows that sixty-six officers of the navy and five officers of the marine corps were rewarded for gallantry displayed during and since the war with Spain. Of the naval officers, three are rear admirals, eleven captains, twenty commanders, ten lieutenant commanders, thirteen lieutenants, six lieutenants junior grade and three ensigns. The marine corps officers rewarded include one lieutenant colonel, one major and three captains. Although so many officers were advanced, under the department's ruling that an officer only becomes an additional when promoted to a higher grade than the one in which he was when he received advancement, there are comparatively few additionals. They include three rear admirals, F. J. Higginson, R. D. Evans and H. C. Taylor; three captains, Asa Walker, C. C. Todd and W. J. Swinburne; two commanders, W. J. Bayley and E. H. Merritt; two lieutenant commanders, H. McL. P. Huso and G. W. McElroy, and three lieutenants, E. E. Hayden (reappointed on the active list by special act of congress), H. H. Ward and W. S. Crosley. Only one officer of marine corps, Lieut. Col. G. D. Elliott, is designated as an additional.

Admiral Dewey, by the order, is the ranking officer of the navy. John Adams Howell is the senior rear admiral; W. S. Schley is No. 5 and William T. Sampson No. 7 on the list of senior rear admirals. Frank Wildes is the ranking captain and A. B. H. Lillie the junior captain; W. H. Emery is at the head of the list of commanders; John Hubbard is the ranking lieutenant commander; W. I. Burdick, the senior lieutenant; J. S. Doddridge, the senior lieutenant, junior grade, and T. D. Parker, the senior ensign.

Pan-American exposition rates to Buffalo are in effect April 30 via the Nickel Plate road at one-and-one-third fare for the round trip, good to return within fifteen days. A rate of one fare for the round trip will be made good going on Tuesdays in May and returning within five days. Write, wire, 'phone or call on nearest agent, or E. A. Akers, C. P. & T. A., Cleveland, O. 47, May 30.

MARINE REVIEW

Devoted to the Merchant Marine, the Navy, Ship Building, and Kindred Interests.

Published every Thursday at No. 418-19 Perry-Payne building, Cleveland, Ohio, by THE MARINE REVIEW PUBLISHING CO.

SUBSCRIPTION—$3.00 per year in advance; foreign, including postage, $4.50, or 19 shillings. Single copies 10 cents each. Convenient binders sent, post paid, $1.00. Advertising rates on application.

Entered at Cleveland Post Office as Second-class Mail Matter.

The forthcoming meetings of the industrial commission, which are to be held in Washington and New York, are likely to be of far reaching interest. The commission is desirous of obtaining information regarding the United States Steel Corporation, and has requested Andrew Carnegie, J. Pierpont Morgan and Charles M. Schwab to attend. Andrew Carnegie will not attend, though he has sent to the commission a copy of his views upon trusts written several years ago. Mr. Morgan will give his testimony to the commission some time after his return from Europe. Mr. Schwab will doubtless testify whenever the commission sends for him. He will testify in relation to the practical advantages secured by consolidations of large manufacturing plants. He will take the technical and executive side of it, and there is probably no man in the country more qualified to speak upon these two important departments than Mr. Schwab. Indeed, there is probably no other man in the country who could speak upon them both.

Fairplay of London says that German competition in the English market has probably reached top mark and that it has never been of a character to inspire fear. "American competition, however," it says, "is an unknown quantity, of increasing intensity and with altering conditions whose potentiality we cannot forsee. That is where the trouble is. But American competition is promoted and facilitated, not by technical colleges and commercial education, but by (along with the gifts of nature) concentration of capital, concentration of effort by the division of labor, economy of labor by the use of machinery and sustained industry in production. We do not need a school of economic and political science to teach us these things, nor will such a school, admirable as it is, help us much to deal with them. There is no higher technical skill nor greater commercial ability in America than here. There is simply more concentrated and sustained effort and more devotion to business."

In a race across the Atlantic from Liverpool to Philadelphia, the four-masted ship Kenilworth, owned by Arthur Sewall & Co., Bath, Me., eclipsed all previous sailing records when she passed in the Delaware capes last week, 18½ days from the time of her departure from the river Mersey. From a sailing standpoint this passage has never been equalled by a vessel of the Kenilworth's class, the nearest approach to it being the trip made from Liverpool to New York by the American clipper ship A. J. Ropes, which completed the passage in nineteen days. The difference in time is somewhat over twelve hours and besides the Kenilworth covered 120 more miles in actual distance.

The Iron Trade Review notes the following prices for representative Lake Superior ores, announced since the base price of $4.25 for old-range Bessemers were given out a few days ago: Chapin, $3.78; Champion, No. 1 crushed, $4.66; Republic Specular, $4.92; Kingston, $4.41; Palms, $3.72; Anvil, $4.02; Melrose, $4.19; New Era, $3.92; Millie, $4.68; Ashland, $4.12; Taylor, $3.66; Lake Bessemer, $4.31; Abbotsford (Lake Superior Iron Co. hard Bessemer) $4.86. Non-Bessemer ores have sold at about $1 below last year's prices. Among Mesabi non-Bessemers, Sauntry is quoted at $2.75 and Audrey at $2.35.

Five million dollars will be spent by the navy department in a naval station at Olongapo, Subig bay, Luzon, if congress adopts its plans. Secretary Long has appointed a board composed of Rear Admiral Taylor and Civil Engineers Wolcott and Menocal, to meet at the New York navy yard, to prepare estimates. According to the preliminary survey, the dry dock will cost $1,000,000 and the shops and machinery $4,000,000 more.

Wm. E. Corey, who has just been elected president of the Carnegie Co. and the Carnegie Steel Co., has been connected with the Carnegie organization from boyhood. He began at sixteen years of age in the laboratory of the Edgar Thomson Steel Works. He is thirty-five years old.

Edwin Ball, manager of the Minnesota Iron Co.'s mines since the resignation of D. H. Bacon as president, has been appointed by President Bacon of the Tennessee Coal, Iron & Railroad Co., to be superintendent of the latter company's mines.

DESIGN FOR FAST SCOUTS.

DISTINGUISHED NAVAL COMMANDERS AND CONSTRUCTORS ARGUE FOR AND AGAINST THE BUILDING OF SUCH VESSELS—KIND OF VESSEL UPON WHICH THE DISCUSSION WAS BASED.

At the recent meeting of the Institution of Naval Architects in London Rear Admiral C. C. P. Fitzgerald read a paper upon the subject "A Design for a Fast Scout." In the Spanish-American war the United States converted the Atlantic liners of the American line into scouts, but it is the opinion of Admiral Fitzgerald that these are too large. The text of this paper follows:

"I beg to lay before the meeting a design for a scout of high speed and good seagoing qualities. I am responsible for the general idea of the design, but, not being myself a ship designer, I have been obliged to ask for professional assistance, and Mr. Philip Watts of Elswick has most kindly taken all the trouble to work out the design for me, and to carry out my views, so far as that was possible on a given tonnage; though, of course, we naval officers always want more than we can get, and more than the laws of hydrostatics will admit of. I have also gratefully to acknowledge the assistance of Admiral Sir John Hopkins, whose great experience and sound practical views on all naval subjects are universally admitted..

"The proposed vessel is to be of 3,800 tons, 400 ft. long between the perpendiculars, 44 ft. beam, with a draught of 14 ft., with her normal coal supply on board; there will be two screws, and the collective horse-power will be 16,000. The armament is to be six 4-in. guns and a dozen machine guns. There will be a protective deck 2 in. thick on the slope and 1 in. on the flat. There will be no double bottom through the boiler compartments, but there will be elsewhere. The 4-in. guns will be protected with 4-in. shields, except the foremost and after guns, which will be in 4-in. gun-houses, and the conning-tower will be of the same thickness. The speed is to be 25 knots, but the whole idea of the design has been not so much to procure a very high measured-mile speed for a few hours, as to assure a good, continuous ocean speed, as long as the coal lasts, and this is to be 23 knots. The normal coal supply is 500 tons, but the bunker capacity will be for 1,200 tons, though I need scarcely say that the vessel will not go 25 knots with her bunkers full. The original idea was to have a smaller vessel with very quick-running engines; but, taking into consideration the liability of such engines to give trouble when run continuously at sea, it was decided to have less quick-running engines, and, consequently, a larger ship. The boilers will, of course, be tubulous; probably of the Yarrow type. The ventilation will be artificial, and there will be no cowls. Turbine engines were contemplated; but, after full consideration, reciprocating engines have been decided upon.

"It seems necessary that I should show cause for proposing a design for a ship of war of this tonnage, with such a very insignificant armament. In the first place, then, I would beg to point out that she is not intended to be a ship of war in the ordinary sense of the words; that is to say, she is not intended to be a fighting ship, and thus the proposed armament must be regarded as altogether of a secondary, or rather of a tertiary, importance; the two first qualities aimed at being continuous high speed and good seagoing qualities in all weathers. It will, therefore, prevent confusion, if we call her a despatch vessel, or a scout. She may not make much show on paper, though that is a matter of small importance, if it can be shown that such a vessel, or rather a considerable number of such vessels, would be of the most vital importance to enable us to carry out our avowed strategy in the event of war with a maritime power; and notwithstanding that the want of such scouts may not become apparent until war is actually upon us; in other words, that there is no use for them in peace time. And in this connection I may remind you that, at the time of the Russo-Turkish war in 1878-9, when our squadron passed through the Dardanelles, and it seemed probable that we should be involved in hostilities, the want of fast scouts became so urgent that the government were obliged to buy up hastily a number of Liverpool tugs, as our own small craft of the day were so deficient in speed and coal endurance that they were practically useless for the duties of scouts and despatch vessels, notwithstanding that they could sail. It has often been suggested that we ought to keep ourselves ready for war at short notice, so as not to find ourselves in the position of having to extemporize any important class of vessels as auxiliaries after war is declared, or becomes imminent; and, with regard to scouts, there do not appear to be any vessels in existence which would meet our requirements. The transatlantic liners are too large. The Holyhead boats, and the channel island packets are fast vessels and good sea boats, but their boilers and engines are unprotected, and their coal supply altogether insufficient to enable them to act as scouts; and our old friends, the Liverpool tugs, are scarcely up to present-day requirement with regard to speed.

"It is generally understood that, in the event of war with a maritime power, it would not be possible to institute a close blockade of the enemy's ports, in the same way that we blockaded during former naval wars; but that it would, nevertheless, be absolutely necessary that we should be able to watch those ports in such a manner that the exit of hostile ships in any considerable numbers could not take place without the admirals in command of our battle squadrons being promptly informed of the fact. But, although this is the leading feature of our avowed strategy, it is difficult to see how it is to be performed, or what warships we have capable of doing it. If we begin with our first-class cruisers we will conclude that they are too valuable to be exposed to the great risk of watching off an enemy's port, which probably would contain numerous torpedo boats, and, perhaps, some submarines; secondly, there are not enough of them; and, thirdly, they would have quite enough to do in protecting our trade routes from the depredations of hostile cruisers, which are certain to escape, in spite of the closest watching. Next, take our second and third class cruisers, with nominal speeds of about 19 and 19½ knots, some of the smaller ones (the 'P' class), having a speed of 20 knots in smooth water. It does not seem likely that these vessels will be permitted by an enterprising enemy to keep watch off a port which will probably contain several powerful armored cruisers of large size, and with nominal speeds of 21 knots. These vessels would appear on the scene some fine morning at daylight, with a good head of steam ready and sink or capture our

watchers, as the latter would not have sufficient speed to escape, even under the best conditions.

"The fact that our second-class cruisers have not improved in speed during the last ten years was forcibly pointed out by Admiral Sir John Hopkins a short time ago, in a very interesting and comprehensive paper which he read at the Royal United Service Institution. The increase in size in the more recently built vessels of this class, and the saving of weight effected by the use of water tube boilers, have been devoted to giving them a more powerful armament, but without giving them any material advance in speed (half a knot nominal, I think it is.) It is not for me to criticize this policy. I merely point out that these later vessels do not appear to be any better suited to perform the duties of scouts than their older sisters; in fact, for some reasons, rather less so, as they cost about £50,000 more money. Our torpedo gunboats have not sufficient speed, or seagoing qualities, to enable them to act as scouts to our battle squadrons; and, lastly our destroyers have neither the size, sea-keeping qualities, nor the coal endurance to fit them for the duties; though they are doubtless excellent little vessels for the purpose for which they were intended.

"Recent events in South Africa have illustrated the extreme importance of efficient scouting in land warfare; and, if we may reason by analogy, there seems to be cause for believing that scouting will be of at least equal importance in the event of a great maritime war. I have thought it desirable to enter at some length into my reasons for proposing a vessel of this tonnage, speed, and horse power, with such a very light armament, though I am ready to admit that such vessels are not wanted in peace time."

PROPOSED DESIGN OF SHIP BRINGS OUT INTERESTING DISCUSSION.

Admiral Fitzgerald submitted for criticism the design of the proposed vessel. The discussion is quite fully reported in Engineering of London. Capt. Clover of the United States navy was the first speaker. He said that the experience gained by American naval officers during the recent war with Spain was that there was very great need for scouts; they had employed ocean liners for the purpose, and had found them extremely efficient. As a result it had been concluded that it would not be desirable to build vessels especially for such purposes. Such craft must be of considerable size—a ship of 3,000 or 4,000 tons was hardly equal to maintaining speed in heavy weather during long voyages at sea. The ocean liners were, therefore, best fitted as long-distance scouts, whilst destroyers would fill the position of small scouts for closer operations. They ascertained, however, that in order to find the enemy's fleet they had to cruise all over the West Indies. Many vessels were required to form the big fleet of cruisers necessary, and, therefore, they had come to the conclusion they must depend on the ocean liners, keeping torpedo craft for close scouting.

Admiral Sir John Hopkins said that with all respect to the opinions just expressed by his American friend, he did not think the big ocean liners would be able to carry out the work of scouting against a formidable naval foe; say, for instance, one of these vessels was sent to watch certain straits, they would be chased off by more powerful vessels. We had plenty of 20-knot (measured mile) second-class cruisers, but they would be no good against 21-knot cruisers. Nelson had said that the want of frigates would be engraved on his heart. He needed scouts equal to those they would have to meet, but if they were run down they could not get the information that was needed. It was useless to send a ship into a position of danger of being overhauled and taken. He would always urge something more than 20-knot speed. Years ago Sir William White, with that rare skill which distinguished him, had designed 20-knot cruisers, but since then he had not gone further in this type of craft. Why, he would ask, was that? He was certain that a naval constructor could progress further if he liked; what, then, held his hand? Capt. Mahan had said that rapidity in action was the most pressing need of a cruiser, other points were subordinate. Com. Ballard, an authority on such matters, asked for first-class cruisers to be brought to a speed of 23 or 24 knots, that second-class cruisers should be 22 knots, and third-class cruisers 21 knots. The speaker considered he was a moderate man in going no further. Foreign vessels were designed for 23 knots and were expected to get 24. In face of this, should we not also go higher? In conclusion, he thought the design shown should be built to, as it was the right kind of ship and one we needed.

Capt. May, R. N., said he understood that this ship was to be able to run away, with the certainty of escaping a second-class cruiser, but it would be doubtful if it could escape from a first-class cruiser, as it was of small size, and would be unlikely to keep its speed at sea. It could, however, be driven off by a second-class cruiser, but it would, in turn, drive away a third-class cruiser or a destroyer. Suppose, however, ten of these vessels were needed, it would be necessary to go to the house of commons and ask for £2,750,000 and 3,000 men. Taking the estimate of £100 per head, a very large sum of money would be demanded for ships not able to stand up to anything except third-class cruisers and destroyers. In regard to power, it was always understood in the past that the British frigate should beat a French vessel of the same class, but when America produced frigates more powerful than our own, an order was given that our frigates should not go out excepting in pairs. This vessel proposed was not, therefore, a "Nelsonian" frigate. In regard to scouting, he would point out that the general operation was for the vessel seeking information to endeavor to come up with the enemy's fleet. In closing in she would meet a cruiser, and if the latter were one of the larger class she would be driven off, and probably see nothing of the hostile fleet but the one cruiser, and would, therefore, be unable to report the nature of the enemy's force to the admiral. He did not see much good in the proposed ship, nor how it would fit in.

OPINIONS FROM SIR WM. WHITE AND OTHER DISTINGUISHED CONSTRUCTORS.

Sir William White pointed out that about three years ago a proposal was made in France to build two vessels closely approaching Admiral Fitzgerald's design. The vessels were described in detail, and a grant was made; but they were not yet begun, and the grant had not reappeared. There had been in the past considerable discussion as to the value of swift vessels moderately armed, and he thought the balance of opinion was on the side which Capt. May had supported. If the size were kept down, and the speed were high, there must be sacrifices, as Admiral Fitzgerald had said. He thought that though 200 revolutions was slower running for the engines than in torpedo craft, it was still high, but the type of boiler could not be used without some falling-off at sea, and he considered 23 knots as a sanguine estimate. Still there was a large margin, but he thought 17,000 H. P. would have to be reduced as a continuous speed performance.

Mr. Philip Watts said that in regard to the remarks made by Sir William White, it would doubtless be of interest if he gave figures showing how the displacement of the vessel described by the author was made up. They were as follows: Hull and fittings, 1,820 tons; machinery, 820 tons; protective material, 330 tons; armament, 130 tons; equipment, 150 tons; normal coal, 500 tons. The 820 tons was sufficient for two sets of four cylinder engines, which at 230 revolutions would give 17,500 I.H.P. For this ample steam would be given by sixteen Yarrow straight-tube boilers, working at less than three-quarters full power, and at slightly under 200 revolutions they would get a speed of 23 knots. That would be with 2 in. of air pressure at the outside. Working, therefore, with 75 per cent. of the maximum performance of the boilers, there would be a quarter of the number available for being cleaned. That, no doubt, would be a high performance, but experience with recent ships had shown that it could be realized. If it appeared more than could be done, as probably it might to some, he would state that he had consulted engineers who had most experience in work of this kind. Mr. Marshall had said that the result could be reasonably looked for, and Mr. Robert Humphreys was prepared to undertake the work on these lines. He wished to state that the design shown was not his. His own feeling was that the ship should have a stronger armament. He would like to see, at least, two additional 6-in. guns, so that the ship would be able to meet a cruiser of the same size; by adding 200 tons to the displacement, two 6-in. guns and submerged torpedo tubes could be introduced; another 200 tons would give eight 6-in. guns in place of two 6-in. guns and six 4-in. guns, the speed remaining the same. The addition to the cost would be about £40,000, an outlay which he thought would be quite warranted by the advantages gained on an original total cost of £270,000.

Prof. Biles said that Capt. Clover had given the results of practical experience in regard to the advisability of building such ships as the author suggested. The policy of using high-speed steamers as scouts had been questioned by others. He himself had read a paper at the Southampton meeting of the institution on the possibility of adapting mercantile steamers for war purposes, especially for scouting. He had suggested a way of putting armor on a mail steamer, and so placing her in a defensible condition. Admiral Fitzgerald asked for his design £250,000, but the speaker would build a mail steamer on the lines he suggested for that sum, and which would be as good for war purposes, but would earn money in the time of peace. It was for naval officers to settle the need for scouts; but if that exists, Capt. Clover's views were important. If they could use mercantile vessels for scouting, the available money under the navy estimates might be devoted to building vessels more intended to fight and not to run away.

MASTERS AND ENGINEERS OF LAKE VESSELS.

Lake Sand & Gravel Co., The, R. E. Doville, Sec'y, Toledo, O.: Steamers—Walter D., Capt. Byron Warner, Engineer Frank Shepler; Laura D., Capt. Frank Lamb, Engineer Valentine Felder; Commerce, Capt. Egbert Doville, Engineer Levi Eaton; Ella G., Capt. Richard Lynn, Engineer Geo. Gillespie; Syracuse, Capt. John Mulinix, Engineer Jacob Mulinix.

United States & Ontario Steam Navigation Co., Wm. Wollatt, Mgr., Conneaut, O.: Steamer—Shenango No. 1, Capt. R. R. McLeod, Engineer F. Wood.

Stewart Transportation Co., C. F. Bielman, Mgr., Detroit: Steamer —C. F. Bielman, Capt. Fred Stewart, Engineer Robert Lacey.

ITEMS OF GENERAL INTEREST.

The American Steam Gauge & Valve Mnfg. Co., Boston, Mass., celebrated the fiftieth anniversary of its organization on Tuesday of this week.

A bill to incorporate the Dominion Steel Ship Building Co., which has been before the legislature at Halifax for some time, was withdrawn last week.

The Michigan Yacht & Power Co., Detroit, Mich., has just launched a 50-ft. gasoline power boat for the Lewis River Mining & Dredging Co. for use upon the Yukon river.

Bartlett & Tinker, steamboat agents of Cleveland, announce that the first steamer of the Lake Superior Transportation Co.'s line will leave Cleveland on or about April 25. The first steamer of the Merchants Montreal line, also represented by Bartlett & Tinker, will leave for Montreal and other eastern Canadian points about April 26.

A chart of Agate and Burlington bays (Two Harbors) has just been issued and may be had from the Marine Review at 20 cents. As the district covered is small, the chart is on a large scale and shows clearly all the docks at Two Harbors. It is valuable also as a chart covering a part of the north shore of Lake Superior that is most visited by the ore and coal carriers.

The fire which visited the works of the B. F. Sturtevant Co. at Jamaica Plain, Mass., on Sunday last, proved to be far less disastrous than was first reported. Only the engine and electrical departments were injured. The power plant was started up with but a single day's delay incident to renewing belts damaged by fire, and the entire blower, heater, forge, galvanized iron and shipping departments with the foundry, pattern shop, etc., were in full operation on that day and the shipments going forward as usual. No valuable office records were lost, the most serious damage occuring in the advertising department, where a large amount of printed matter was destroyed. Fortunately, however, an entirely new general catalogue was in press at the time and copies were issued on the 16th in time to meet all demands for information. New offices were established on Monday morning in a nearby building, and at noon Monday the business was running as usual. With these facilities at its disposal there is no likelihood of any delay in shipments except such as may occur in the electrical and engine departmens, and arrangements are already made for handling this work.

REAR ADMIRAL MELVILLE ON SUBMARINE BOATS.

Rear Admiral George Wallace Melville, chief of the bureau of engineering, has written an article upon submarine boats for the North American Review, in which it is quite clear that he looks doubtfully upon them. He says in part:

"With many exceedingly aggressive forces arrayed in favor of the submarine boat it can be expected that determined efforts will be made to construct more boats of this character. The majority of naval students and experts, however, are still agnostics upon the question, because they believe that there is nothing in the capabilities of the boat which have so far been demonstrated to justify its extended use. It is possible that the type may eventually be developed to a state of reliability and efficiency; but when the serious difficulties which must first be overcome are taken into consideration it will be evident that that hope can be realized only after important improvements have been effected. The inherent defects which confronted the inventors of a hundred years ago still exist in the submarine type. Broadly speaking, the craft is still without an eye to direct her movements. The compass on a submarine boat must, of necessity, be an unreliable instrument. As it must be placed near masses of iron or steel which are liable to be moved, there must be a constant change of directive force. When a torpedo is fired, when a spare one is placed in the tube, or when the conning tower hatch is put on, the compass must be affected. Extraneous influences, such as chain cables, vessels at anchor, or passing ships may cause a deflection of the compass. Practically, but little advance has been made in securing increased stability. There can be little or no longitudinal stability in any boat which is designed to dive like a porpoise. Transverse stability can be secured, but longitudinal cannot be gotten without making sacrifices which would seriously interfere with the boat's efficiency. Much has been written about the speed of the vessel, and yet there is no evidence that any submarine boat has ever been able, on a submerged run, to secure a six-knot speed for three successive hours. Some remarkable statements have been made as to the time required to submerge and raise this type of boat. In any boat where there is but little reserve buoyancy, care must of necessity be exercised in adding, removing, or shifting weights. Therefore, in filling and blowing out the submerging tanks, which hold at least twelve tons of water, a considerable period of time must be required. It is simply a mechanical impossibility for the Holland to be safely submerged to even a depth of ten feet in less than one minute. Of course, she can be sunk by an enemy or ill-disposed person in less time, but it is not the purpose of her designers to have her own crew perform this evolution.

"In using three distinct systems of mechanical energy, many of the submarine torpedo boats have an inherent weakness. In the Holland, a small boat of 75 tons, gasoline, electricity and compressed air are used for different purposes. Gasoline is extremely liable to explode. At least one of its products of combustion is extremely dangerous to life. It is very attenuated, and therefore a great searcher. If there is a defective joint, or pipe, or leaky valve, the gasoline will find it. In a boat of the character of the Holland it must be difficult to keep the electric motors in a high state of efficiency. The compartment must of necessity be damp, and therefore drops of water are likely to fall on every part of the motors. Salt water is liable also to fall down the hatches and ventilators, thus menacing the dynamos and storage batteries. The air flasks may be an element of danger, since they are charged to a pressure of 2,000 lbs. The explosion of any one of these tanks would destroy the vessel.

"There are three sets of gearing. The use of gearing on board any ship is at least inadvisable, for, no matter how strong the hull is made, there must be in a seaway some working of the vessel, and the gear is likely to break if it does not become impaired. The noise in the engine room is a serious disadvantage. The gas engine is subjected to shock rather than to steady pressure, and therefore the engine pounds heavily. As all three sets of gearing are running continuously, there is considerable noise from that source. Since the explosion of the gasoline is effected by a spark from an ignition storage battery, any accident to this battery would throw the gas engine out of operation. This may prove a serious weakness, since the cells of the storage battery are in such an exposed position that they could be very easily impaired. Despite these weaknesses of the Holland she possesses some value in her ability to possibly reach unseen the enemy's fleet, discharge her torpedo, and immediately disappear and get away. A semi-submerged boat would have greater advantages."

LAYING CABLES FOR NEW EAST RIVER BRIDGE.

On April 7 the John A. Roebling's Sons Co. took the first important step in the making and laying of the cables for the new East river bridge at New York. The contract was awarded to the company several months ago and the preparation of plans and other preliminary work, as well as the main part of the contract, which is to follow, is under the supervision of Mr. Charles G. Roebling, the president of the company, who is assisted by Mr. William Hildenbrand. The work done during the past week was the placing in position of the 2¼-in. diameter ropes which support the temporary foot bridge on which the workmen will stand during the main work of cable laying. Several methods of getting the first line across have been employed in the past, and kites, swimmers and other agents have been tried, but the method employed on this occasion has never been tried before, and is a distinct advance over all previous ones. The method adopted was to carry the drum containing the cable across the river on a float (one end having previously been secured) and pay out the cable, allowing it to rest on the river bed until at the proper time it could be raised from the water and to the desired height by means of a stationary engine and drum. The first cable was successfully raised on April 11, the time required being only seven minutes, navigation being, of course, suspended during that period.

A very heavy increase in the make of pig iron is again reported. Production on April 1 was at the rate of 296,676 tons weekly. This quantity has been exceeded twice in the history of the industry—on Dec. 1, 1899, when 296,950 tons were produced, and on Feb. 1, 1900, when the output was 208,014 tons. The remarkable feature of the situation is the decrease of 69,568 tons in furnace stocks during March in the face of this enormous production, while in six months the loss in supply has amounted to 203,656 tons.

ADVANTAGES OF INDUSTRIAL COMBINATIONS

Some of the clearest articles in justification of industrial combinations which have appeared in the magazines and periodicals during the past two years have been from the pen of Charles R. Flint of New York, who has been very active in forming such combinations. He is a firm believer in them. He believes that they can prevent panic, can weather any economic disturbance, and that while they cannot forever guarantee prosperity, for like all things else, they are subject to the law of supply and demand, they can, however, ease the period of inevitable depression. In his testimony before the industrial commission at Washington this week he said:

"My experience has been that the best way to meet the conditions that arise through industrial combinations is by accurate comparative accounts rendered monthly, which permit a comparison of the general results accomplished at the various establishments, carrying it down to detail, and at the same time giving the managers an interest in the profits of the business they direct. On the other hand, there are lines of business that are of such character that a central management can direct the business in a way that it can be all handled from a central office. These latter combinations can be illustrated by reference to the manufacture of metals. This can be reduced to accurate system. The salary of the chief officers of the metal industrials is small compared with the salary paid local managers in other industrial concerns. I have never had a strike in any industrial I have been connected with. That statement is the best evidence that could be produced to show that we enjoy the good will of our laborers. I cannot say, however, whether or not union men are employed.

"Every year our export trade is going to become more and more important, and I think we should attempt freer trade. I think the only danger that exists at present in international trade is that of a war of tariffs. I think any legislation that would discriminate against trusts in general without differentiating would be most disastrous to the labor in this country and would create an industrial panic. Combinations have been useful in stimulating export trade, and the best evidence is in the fact that the great bulk of our exports of manufactured goods are produced by the great combinations. There are times when because of a surplus manufacturers will seek foreign markets at a concession, but it is not true that we sell abroad at a lower price than at home. The industrial combinations can regulate the production, and are less likely to be under financial pressure than the small, independent concerns, hence they are not forced to sacrifice their products either at home or abroad.

"I think the tariff is necessary to keep those trusts here in which hand labor represents a large percentage of the cost, and where this country offers no advantages in the way of raw materials. Where we have raw material and where American labor is bossing machinery I believe the tariff has no effect one way or the other. I believe that wages should be sustained. It is important that we should have widely distributed markets, because in that way we are less subject to the disadvantages of foreign tariffs, of contraction and expansion. A world-wide combination cannot be; it is not within the range of possibilities; a man of sufficient intelligence to manage it cannot be found. The price of articles sold by the industrial combinations is regulated by the cost. We are working under the same law, which is universal, that the lowest price makes the market. Our export of manufactured goods does not amount to over 5 per cent. of the consumption in the United States.

"I regard the reciprocity theory as the highest evolution of the protective policy, but there is danger in extending reciprocity too far. Industrial combinations, unless favored by public franchises or by government patents, are subject to the law which regulates the market, and to exist must create and sustain facilities that result in producing articles at the lowest cost. Inasmuch as the output of a great combination is very large a reduction of prices that would be small to an individual concern becomes enormous to the combination. The conditions must therefore be exceptional to warrant a cut in prices by a combination. If a great combination creates facilities for more economic production it will hold the market by making lower prices for the consumer, and thus result in the greatest good to the greatest number. Wages are being sustained by the combinations. The workman is getting more money for his labor and his wages are given a greater purchasing power. There is a growing feeling on the part of the workmen that they are benefiting by the industrial combinations.

"There are a hundred times as many people interested in our industrials as there was twenty-five years ago, and ten years hence there will be a hundred times more. The industrial combinations are giving the public an opportunity to share in the profits. The average earnings of thirty-seven railroads amount to about 4¾ per cent. of the market price, and a little more than that on the par value of the securities, and if it had not been for the creation of these industrial securities that percentage would have been considerably less. The earnings of forty-seven important industrials, not including the Standard Oil, is over 7 per cent. on the capital and over 11 per cent. on the present market price.

"Overcapitalization has been prejudicial and disastrous. It has made investors and bankers more careful. Trade is best regulated by natural laws, and legislation cannot supplant the law of supply and demand. I believe that American labor is much more efficient than European labor and, in general, where American workmen boss a machine, and where the machinery is doing the work which pauper labor is doing on the other side, the industry would remain here, tariff or no tariff. Where hand labor is employed we can get more for our money in Europe. If you examine our exports you will find that the large percentage of our manufactured goods sent abroad are the product of machinery, where the American workman is an overseer instead of a hand laborer. On the other hand, you will find that the neutral markets for supplies made by hand labor are predominated by the cheap labor countries of Europe. I think the centralized management is the more desirable where there are men of sufficient intellectual capacity to administer the extended business. It is difficult to find men of sufficient capacity to run one large business. There are not many intellectual giants with capacity to run ten or more large business affairs and in my judgment one of the dangers to the success in industrials is that in the absence of intellectual giants we attempt to centralize too much."

SUBMARINE BOATS.

THE ENGLISH TECHNICAL PRESS DOES NOT LOOK UPON THE DEPARTURE OF THE BRITISH ADMIRALTY WITH FAVOR.

In a recent issue the Review noted that the British admiralty had decided to construct several submarine boats after patient investigation of the subject for a considerable length of time. This departure, for such it must be regarded on the part of the British government, is not viewed with favor by the technical press of England. The English papers insist that submarines in their present development are failures. The Engineer of London, which has given considerable attention to the subject, says:

"Our excuse for writing once more about submarine boats is twofold. In the first place their construction and use constitute the most important subjects in connection with navies which for the moment can be discussed. In the second place, we gather from communications which we have received that our attitude concerning the present and future of the submarine boat is misunderstood. We have endeavored to be explicit on the point. We believed that we had been clear. It has been said, however, by an eminent parliamentary speaker that the only way to convince an audience was to repeat the same statement over and over again, if possible, changing the method of presenting the argument. Following this rule, we must, we fear, go over old ground, but we shall endeavor, at all events, to use different language.

"We have stated that it is wholly unnecessary for the British admiralty to do what the French government is doing and has done; and we have said this because nothing done recently in France has supplied valuable information, or served to promote the development of the submarine boat on useful lines. One correspondent claims for the American boat Holland a large measure of success. We say of the Holland what we have just said of such vessels as the Narval, the Morse, or the Gustave Zede. We hold that it would be a waste of time and money for the British admiralty to construct boats in any way resembling these in detail. They demonstrate nothing that has not already been known; but such vessels in no way represent the limit of submarine warfare. There are far more promising directions in which to work; and we shall not be surprised, if, say in six months, we are able to announce that the admiralty has been for over twelve months carrying on investigations and making experiments with a secrecy which is at once essential, and has been preserved with all but complete success. The directing of a submarine boat is not, perhaps, wholly dependent on an eye, a compass, or a gyroscope. The resources of physical science have not been exhausted by either France or the United States, and there may be surprises in store in the future for those who are all impatience in the present. It is clear that many people believe that such a success has been achieved in France that the naval supremacy of this country has been already compromised. They are, however, quite unable to say precisely what that success is, how far it is novel, and whether it is or is not conclusive. Its nature is, we think, very easily stated. It has been proved that a vessel can be submerged; that she can move about under water; and that she can discharge torpedoes. But this much has been known for very many years. We shall not confine ourselves to mere experiment, but speak of what is of more importance, the use of the submarine boat in actual warfare. If our readers will turn to our issue for Feb. 1 they will find an interesting article treating of early attempts of this kind. More recently, that is to say, in 1861 or 1862, a submarine boat was built at Charleston, and used against the federal blockading fleet. She was propelled by a screw turned by eight men, while a ninth man discharged a torpedo. While experimenting with her no fewer than twenty-seven men were drowned. Then she was tried as a surface boat with her hatches open. She attacked and sunk the United States ship Housatonic with a torpedo, and was herself sunk by the column of falling water thrown up by her own torpedo, and five more men were drowned. There is no trustworthy evidence that any of the Nordenfeldt boats ever fired a charged torpedo intended to hit anything. The measure of success in this direction attained in France goes no further than the point which had already been reached, even assuming the results of experiments are as satisfactory as the French press would have us believe.

"Granting that the submarine boat can descend and move under water, that, in fact, we do possess a tool or instrument of war, let us ask what proof is there that this tool can be used to good effect? So far the answer is that no proof exists. The French admiralty are necessarily silent as to what has been done. There is no official evidence available. It has been stated by M. Lockroy that one of the French boats has discharged a torpedo at a fixed target and hit it. But it is evident that it is one thing to take a submarine out of harbor in still water, move her within easy striking distance of a target, submerge her, and then fire a torpedo. The wonder would be if the torpedo missed the target. But impressive as such an experiment would no doubt be to French newspaper reporters, it would not for a moment deceive French naval experts, who would, of course, maintain official silence, no matter what they thought. The conditions have nothing whatever in common with those of naval warfare. Battleships attacking a port would be in constant movement, steaming past it and shooting—in this way greatly adding to the difficulties of the besieged. How would the slow, blind submarine boat discharge her torpedoes with any hope—we shall not say certainty, for that is out of the question—of hitting one of the attacking ships? How great would be the risk that she would run of being smashed by some of the projectiles falling into the sea. If a blockading fleet lay at anchor the patrol boats would be incessantly on the lookout; and even if the submarine succeeded in eluding them, she would find all the torpedo nets down. It is a noteworthy fact that no French naval authority has as yet said one syllable as to the conditions which submarine boats must satisfy if they are to be useful. No one supposes that they can ever operate far from a base, whether that base is a warship or a port. It seems obvious that the best field for the operations of a submarine boat is in the mouth of a navigable river, or in the entrance to a port or harbor. But for the defence of such places we already have mines; and failing these can the submarine boat effect anything that the Brennan torpedo cannot do? Judged by the standard of actual warfare, it may be reaffirmed that the French boats have up to the present achieved nothing. We do not say they have been tried as engines of destruction and failed; but simply that, for some reason best known to the authorities, they have not been so tried. If they had been and succeeded the French press would ring with the news. It is not enough that a vessel shall descend below the surface, and remain there moving slowly about for some hours; she must be able to hurt something; to sink an enemy's ship. We do not assert that the French boats cannot do this; we do say that they have not as yet given the least shadow of proof that they could do it under the conditions of actual naval warfare except by chance.

"To do those who most favor the submarine boat justice, they do not pin their faith on France. They direct our attention to the Holland. We have given the report of Rear Admiral Charles O'Neil, U. S. N., chief of the bureau of ordnance, to the committee on naval affairs of the house of representatives, on the Holland. Regarded as a statement of facts, it will go far to dispel certain illusions entertained in this country. It is, we think, impossible to dismiss this report as the production of a man at once ignorant and prejudiced. No more eminent authority can possibly be had; nor does he stand alone. Rear Admiral Melville, chief of the bureau of steam engineering, holds similar opinions. Against these are the views of Rear Admiral Hichborn, chief constructor United States navy. But one or two extracts from the evidence will suffice to show that he favors submarine boats, not so much because he is sure that they are really good for anything, as because he thinks they could comfort nervous people. Asked if he thought two submarine boats for each port in case of war would be enough, he replied that they would not, but 'they would be a help to nervous people. We had a little experience of that during the last war. The people along the New England coast raided the navy department from morning till night for old monitors that had been condemned more than thirty years; and we took them down there, and the people kept quiet after that. The submarines would be as good a cure for nervous prostration as anything you could get.' It seems to us that just the same end would be answered by an official assurance that the submarine boats were really there, whether they were or not. The ethics of the case are scarcely affected by the presence or absence of a craft which could do nothing in any case; nor, even supposing the boats were efficient, does Admiral Hichborn propose to do anything with them at all approaching in magnitude that intended by a section of the French press. Admiral Hichborn's views are very modest indeed by comparison: 'My view would be to keep them in the harbors. You would find the people of New York very restive if you undertook to take their submarine boats away, except to go outside a short distance, perhaps. They would not need to cruise up and down the coast, or anything of that kind. Harbor defence is what you want them for.'

"Concerning the Holland we need not say more at present. One word of particular explanation is, however, necessary. It will be seen that she has on no fewer than four times burned up the armature of her motor. It may, no doubt, be urged in extenuation that it was not a good armature. Yet the fact will remain that all armatures heat, and that, as set forth recently in our columns by Mr. Sprague, it is simply a question of time how soon they will be burned, unless special precautions are taken to keep them cool. This is next to impossible on board a submarine boat, and this fact greatly limits the amount of power that can be made available for propulsion. Some device may be hit upon to get over this difficulty, but it has not been hit upon yet."

MODERN FOUNDRY PLANT.

The Bullock Electric Mfg. Co., through its secretary, Mr. James Wilson Bullock, has acquired control of 15 acres of land directly opposite the present plant at East Norwood, O. Upon this tract the Norwood Foundry Co. will erect a foundry building 200 ft. long by 150 ft. width; a pattern storage house, fireproof construction, 50 by 150 ft., three stories high; and a modern office structure. All these buildings will be built of buff pressed brick with steel frames and trusses to conform to the present buildings of the Bullock Electric Mfg. Co. The foundry will be equipped with three electric cranes, the largest of which will have a capacity of 50 tons. The side bays, which will be 25 ft. in width, will be served by hand traveling and jib cranes. The plant will be in every way of modern character, and electricity will be used for power and lighting throughout.

While this foundry will be operated under the name of the Norwood Foundry Co., it will serve primarily the needs of the Bullock Electric Mfg. Co. It will also be in position to handle outside orders in the most satisfactory manner. That it will be operated successfully is guaranteed by the fact that it will be under the direction of Messrs. Hoffinghoff & Laue of Cincinnati, a firm whose skill in handling foundry work is everywhere acknowledged.

Work is progressing rapidly upon the Buffalo plant of the Lackawanna Iron & Steel Co. of Scranton and Lebanon, Pa. The company has about 1,400 acres of ground along the lake front near Stony point. The tract includes an extensive harbor shielded by a breakwater, and the company has direct connections with twenty-six railroads entering the city of Buffalo. It is the purpose also to excavate a canal 200 ft. wide parallel to the lake shore from the harbor proper. This canal, which will run along the line of the blast furnaces to be built, will permit of the entrance of the largest ore boats. A contract has just been closed with the Wellman-Seaver Engineering Co. of Cleveland for the entire equipment of unloading and handling machinery. The capacity of the plant will be between 800,000 and 1,000,000 tons of steel per annum and it is expected that the first cast will be made in the summer of next year.

A very interesting test of a simplex vertical boiler feed pump was made recently at the works of the Geo. F. Blake Mfg. Co., East Cambridge, Boston, by F. Meriam Wheeler of the Geo. F. Blake Co., and William A. Fairburn, chief engineer of the Eastern Ship Building Co., New London, Conn. This pump is of a new type and contains many interesting features, promoting economy and smooth running at good speeds. It has been built for a Russian battleship that is under construction in Russia, and is capable of pumping against a pressure of 600 lbs. per sq. in. when supplying feed water for a battery of Belleville boilers. The pump has 9-in. steam cylinder, 6-in. water cylinder and 12-in. stroke. The water consumption was found to be about 60 lbs. per I.H.P. per hour, and with boiler steam at 300 lbs. the pump supplied the desired amount of water against the stated pressure of 600 lbs. per sq. in.

DEFENSE OF THE BELLEVILLE BOILER.

ENGINEERS IN ENGLAND ARE BEGINNING TO ATTACK THE INTERIM REPORT OF THE ADMIRALTY COMMITTEE—POINTS WHICH ARE WELL TAKEN—COMMITTEE WAS CONTROLLED BY OPINIONS OF MERCANTILE MARINE ENGINEERS.

Your Englishman, when it comes to a question of fair play, of hard headed sense and of a desire to give the other fellow a show, is a pretty decent sort of a chap. Latterly engineering authorities throughout England have been stirred up over the interim report of the British admiralty committee upon the Belleville boiler, because to them it presents evidences of palpable injustice. Singularly enough the expression of their opinions has first been given to the public through the columns of the London Times, which testifies to the high regard in which that journal is held and to the character of its circulation. There are few newspapers in America which would be selected to exploit a technical subject. The first communication in the Times is from Sir Edward J. Reed. Sir Edward is not enamored of the composition of the committee, because he says the vast majority of its members have had no personal acquaintance with the working of the Belleville boiler, although many of them are undoubtedly men of the greatest experience in connection with the boilers in use in the merchant navy. These are his words:

"The question at issue being essentially of such a nature as only men more or less closely acquainted with the engineer service of the royal navy could deal with thoroughly, Lord Goschen appointed one engineer, and one alone, of all the competent royal naval engineers within his reach, the other engineering members—five in number—being men able and experienced in mercantile engineering practice beyond all doubt or question but every one of them devoid of that very special experience which is absolutely essential to a full and effective grasp of the subject."

Sir Edward also calls attention to the pertinent fact that not all Belleville boilers in the navy have failed but only some of them. It is a question therefore whether failures when they occurred have been due to the inherent defects of the boiler or to the inherent inefficiency of the engine room staff. He says:

"But, great as may have been the troubles which beset this new branch of naval work from a scientific point of view, I cannot doubt that the human element have been a very grave cause of the breakdowns such as they have been. Certain it is that there are many ships in our own and other navies supplied with Belleville boilers in which no sort of danger or difficulty has ever been experienced. The Japanese have had warship after warship of the largest classes fitted with Belleville boilers, and no complaint has ever been made of them. They are fitted in the most powerful Chilian cruiser O'Higgins and her trials out of Newcastle were made under the most disadvantageous circumstances, the English stokers striking for more pay on the very morning of the first trials. But the Chilian stokers, who happened to be on board, took the boilers in hand, and her two day's trials were completed without difficulty of any kind. That ship, during three years of service, has steamed some 30,000 miles, often at the highest speed and never has had a single tube burst or burn or prove bad. The only difficulty that has ever occurred with her boilers was a small one, which clearly arose from neglect and was in no way special to the type of boiler. Very bad accidents and very numerous injuries may readily occur when naval boilers have to be adopted on a very large scale. But experience has taught me to believe that perfect management is as necessary as a perfect machine. Bad or mistaken management may break down any machine, and it is idle, where one machine answers well and another precisely like it fails, to attribute the failure to the machine, or to anything else than the management. The Belleville boilers of the Japanese, Chilian or other foreign ships, which never break down or give trouble, are precisely like those of our ships which have broken down; and in such a case it is not difficult to conjecture the cause of our failure. It is even less difficult when we remember that so many of our own Belleville boilers in the royal navy are worked on service with complete success."

Another engineer of authority, whose name unfortunately is withheld, discusses the interim report in a most vigorous manner. After reviewing the personnel of the committee, and excluding Mr. J. A. Smith, who was the one man upon the committee most thoroughly acquainted with the Belleville boiler, he says:

"They are first-rate men, of the highest integrity, with much experience in the mercantile marine, knowing thoroughly the requirements of its propelling machinery both from commercial and technical standpoints, and with the fullest knowledge of cylindrical or tank boilers in their various forms; but I believe I am perfectly correct in stating that no one of them has ever constructed, or worked, or taken the responsibility of constructing or working, a set of water tube boilers of any description for a steam vessel. Yet they are called upon to pronounce judgment and give expert opinion upon a subject of which they have no actual knowledge based upon personal experience, and in which, therefore, they must necessarily rely entirely upon such evidence as they have been able to gather in a somewhat limited period of time. There are many engineers, both at home and abroad (I do not include inventors or those connected commercially with any special type of boiler), who have spent years in constructing and working water tube boilers, the presence of whom upon the committee is conspicuous only by their absence. I hold no brief for M. Belleville, sentimentally; indeed, I should much prefer that a British boiler should be adopted in our navy and a Briton receive whatever credit and gain are derivable therefrom. Commercially speaking, I consider M. Belleville has received more than enough money from this country to amply compensate him for his patents and any assistance he may have rendered in connection with his boiler which has now practically become common property; but, in a case of such importance as that under consideration, personal feelings must not be allowed to bias one's judgment. The true position can only be ascertained by calm and critical examination from every point of view."

REVIEW OF THE COMMITTEE'S OPINIONS.

Let us now take the report as it stands before parliament and the public, and I venture to think it will clearly be seen by an impartial observer how the judges in this case have, unwittingly, been led into committing an error of justice. Broadly speaking, the recommendations of the committee amount to the following:

(1) The committee are of opinion that the advantages of water tube boilers for naval purposes are so great that, provided a satisfactory type of water tube boiler be adopted, it will be more suitable for use in the navy than the cylindrical boiler.

(2) The committee do not consider that the Belleville boiler has any such advantage over other types of water tube boilers as to lead them to recommend it as the best adapted to the requirements of the navy.

I always understood that the committee were requested to discover, if possible, a better boiler than the Belleville, which is a very different thing from the expression of an opinion that the Belleville is no better than others. The Belleville has now been adopted very widely; manufacturers throughout the country have been placed to great expense in erecting plant for the purpose of constructing it, much trouble and time have been spent in educating the engine room ratings in its proper management and working, and all this is to be thrown away because the committee are of opinion, not that it is worse than other types, but that it is no better! Concerning paragraph three and the recommendations contained therein I have nothing to say.

In paragraph four the committee select four types of boilers, namely, the Babcock & Wilcox, the Niclausse, the Dürr and Yarrow large tube boiler, and state that if a type of water tube boiler has to be decided on at once for use in the navy some or all of these types should be adopted to the exclusion of the Belleville.

In paragraph five so uncertain are the committee of their ground that they urge the rapid completion of the two sloops and second-class cruiser fitted with Babcock & Wilcox boilers and the sloop and cruiser fitting with Niclausse boilers in order that they may have some idea as to the value of these types for naval purposes. Moreover in paragraph six they desire that boilers of the Dürr and modified Yarrow types be made at the earliest possible date under their supervision and fitted in two comparatively small cruisers in order that they may ascertain their value as steam generators and their applicability to the services required of them. In paragraph ten they agree that the admiralty were justified in regarding the Belleville as the most suitable type of water tube boiler for the navy by reason of its long and satisfactory service at sea.

GREAT NUMBER OF BELLEVILLE BOILERS AFLOAT.

Now, how does the action of the committee, in the light of the foregoing paragraphs, appear to the ordinary observer? In 1894, or, say, seven years ago, the Belleville boiler was considered the most suitable for adoption upon a large scale in our navy, owing to the fact that it had then been working at sea, both in the mercantile and military marine, for a considerable number of years with satisfactory results. I fail to see how the committee can prove that in this year of 1901 the Belleville boiler does not hold precisely the same position with regard to its competitors. There are certainly more of them afloat, not counting our own navy, than water tube boilers of any other type, and when it comes to years of service and continuous work at sea the committee must know perfectly well that no other water tube type of boiler can show one-tenth of the Belleville record. They have now been working seven years longer than they had in 1894; consequently, if the arguments of seniority, or of extensive adoption, or long experience in working hold good, then the Belleville boiler still holds the palm. But no, the committee ignore all this, and recommend, in a hazy kind of way, the adoption of all or sundry of four other types of boilers (pick them out where you like, so to speak, all the same price), tacitly admitting at the same time they have not had the opportunity of investigating the various merits or disadvantages of these boilers, and consequently urging the admiralty to fit some of them on board a vessel as rapidly as possible in order that they may have an opportunity of learning a little more about them. Be it noted, too, that the committee take no direct responsibility in the matter; some one else has to do that—admiralty engineers, to wit. This seems a very extraordinary recommendation, and one, I should say, that the admiralty of this or any other country would hesitate in following.

AN INDIFFERENT WORKMAN COMPLAINS OF HIS TOOLS.

In paragraph six they account for the course they have taken by stating that their opinion has been expressed after a personal examination of the boilers of his majesty's ships Diadem, Niobe, Europa, Hermes, Powerful, Furious and Ariadne, upon the evidence placed before them, and the statements of the chief engineers of those vessels and others of the engineering staff of the admiralty and dock yards. Let us regard this paragraph for a moment. Nearly all the vessels they mention have given considerable trouble with their boilers. Such troubles, it is an open secret, have arisen partly from bad workmanship and partly from bad management, and the evidence upon which the committee base their opinion has been obtained from the chief engineers of these vessels, who, by virtue of their position, are held to a great extent responsible for the boilers' failure. Is it likely that these men are going to throw too much blame upon themselves in the matter? Is it not human nature that they should put as much blame as they reasonably can upon the boilers? An indifferent workman always complains of his tools. Not that for one moment I desire in the least to condemn the engineers, for they were very largely victims of circumstance. They were placed in charge of immense cruisers fitted with a system of steam generating plant entirely new so far as their experience was concerned; they had to find out the way to work it as best they could, and I know for a fact that in many cases the cost of buying that experience was very great indeed. Did the committee take evidence from the chief engineers of successful vessels which have been running at sea and doing excellent work for the past ten to twelve years? As for extra skill being required, these boilers are worked by men of every nation in the world, and surely we can do as well. If the engineers were not made acquainted with the simple instructions connected with the working and preservation of boilers, most of the difficulties are easily accounted for.

On the score of excessive coal expenditure with the water tube boiler for distilling and other auxiliary purposes the committee have undoubtedly been misinformed. Our vessels fitted with Belleville boilers should not now consume more coal for auxiliary purposes than those fitted with the cylindrical type. The first-class cruisers were generally understood to be burning somewhere about eight tons a day for auxiliary purposes. On board a cruiser of the same class it was found that about three tons were sufficient to supply the necessary steam for certain auxiliaries. Steps

were taken to verify this result, and it was found to be perfectly correct. The chief engineers of the vessels consuming the extravagant quantity of coal were requested to visit the Spartiate and see for themselves whether her coal consumption was correctly reported or not. They saw, were satisfied, and returned to their ships to do likewise. It would appear from the report of the committee that it is principally upon the evidence of these engineers that the condemnation of the Belleville boilers has been based. Further comment is superfluous.

PRACTICAL CONCLUSIONS.

What I have written may appear to be in the nature of a complaint against the members of the committee, but I assert that nothing is further from my mind. The report is precisely what might have been expected from the men who made it. To judge of others one must as far as possible try to imagine oneself in their place. If I had spent the greater part of my life dealing with machinery of the mercantile marine, with its collossal engines, ample dimensions, spacious engine rooms, and simple auxiliary system, and if then I had been called upon to visit some of his majesty's first-class cruisers that had temporarily come to grief with their cramped engine spaces, multiplicity of auxiliary machinery, extensive ramification of pipes, and multitudes of valves, many of them in almost inaccessible positions, and if in addition I had seen a large number of apparently very complicated boilers undergoing repair, I should probably have jumped to the conclusion (in my inability to blame my old friend the triple expansion engine) that the whole of the trouble lay in the Belleville boiler. But my conclusion would have been an erroneous one. The fact of the matter is that the committee have been forced to issue a report and express their opinion without having been allowed sufficient time to investigate fully the important subject placed in their hands.

To conclude, let us consider what is best to be done. With regard to the total abolition of the Belleville boiler, I say certainly not. It is better to deal with a devil you know, than to place yourselves in the hands of a devil or devils you do not know. We do not want the Belleville, Dürr, Niclausse, or any other special boiler; what we really want is the best boiler, and by all means let us endeavor as far as possible to find it. With regard to comparative trials I would go further than the committee. The boilers they select have all passed their experimental stage; then why fit them on sloops or small craft? Why not try them in a first-class cruiser of 22,000 H.P. beside one fitted with Belleville boilers, the same design of machinery being adopted for both vessels? We could afford the risk, because although some of the boilers will prove themselves to be better than others I do not think there is much chance of any of the types selected proving to be an utter failure. These vessels should be tried upon equal conditions and for prolonged periods; the weak points of both systems will then very soon be discovered. Practically the whole trouble of the Belleville boiler in our navy can be traced to causes inseparable from the introduction of an entirely new system of steam generators upon an immense scale. In our navy we commenced with the Powerful and Terrible, then the largest cruisers existing, and have continued to build huge vessels such as have never before floated, and these vessels have been placed in charge of men who have never had an opportunity of gaining experience or becoming thoroughly acquainted with the machinery for which they were responsible. To quote an example of how long it takes for the men in a navy such as ours to acquire a knowledge of a special system like the Belleville—on board a battleship recently completed there was not a single engineer who had previously been at sea with boilers of this class, and consequently to all intents and purposes the machinery of that vessel was, so far as the knowledge of the engine-room staff was concerned, in precisely the same position as that of the Powerful and Terrible, the first ships fitted with Belleville boilers in our navy. Time is required, but every day the situation improves, and it will now improve more rapidly, as knowledge concerning both the manufacture and the management of the boilers is becoming more widely spread. It is useless to be hasty about it. Let us proceed carefully; by all means find something better, but make sure it is better before adopting it on a large scale.

PRESIDENT'S VISIT TO CALIFORNIA.

LAUNCH OF THE BATTLESHIP OHIO IS THE OBJECTIVE POINT OF THE LONGEST TRIP THE PRESIDENT HAS EVER TAKEN.

The complete itinerary of the president's tour to San Francisco to attend the launching of the battleship Ohio has just been made public. The trip is the most comprehensive that the president has ever taken and has only been equaled by the trip which President Harrison took during his term of office. The president, Mrs. McKinley and party will leave Washington by the Southern railway on Monday morning, April 29, at 10.30 o'clock, for a tour to the Pacific coast and return, covering a period of between six and seven weeks. They will have a train consisting of a private car for the president and Mrs. McKinley, two Pullman compartment cars, two Pullman sleepers, a dining car and a combination car. Col. L. S. Brown, general agent of the Southern railway, will accompany the party from here to New Orleans and from New Orleans to Portland, Ore., Mr. E. O. McCormick, passenger traffic manager of the Southern Pacific lines.

The members of the cabinet will accompany the president, with the exception of Secretaries Gage and Root and Attorney-General Knox, the personnel including Secretary and Mrs. Hay, Postmaster-General and Mrs. Smith, Secretary and Mrs. Long, Secretary and Mrs. Hitchcock, and Secretary and Miss Wilson, Miss Mary Barber, Mr. Henry T. Scott, Mr. and Mrs. Charles A. Moore, Secy. and Mrs. Cortelyou, Dr. and Mrs. Rixey, Assistant Secretary Barnes, Mr. M. A. Dignam, several stenographers, representatives of the three press associations, the three illustrated weeklies, the three Washington dailies and probably a representative of the press of San Francisco. The party will also be accompanied by Mr. Marean, manager of the Western Union Telegraph Co. at Washington, and Mr. Ribble, manager of the Postal Telegraph Cable Co.

The train will go by way of Alexandria, Charlottesville, Lynchburg and Roanoke, Va., Huntsville, Decatur and Tuscumbia, Ala., and Corinth, Miss., arriving at Memphis, Tenn., 4.30 p. m. Tuesday, April 30. A stay of several hours will be made in Memphis, the party leaving there during the night for New Orleans, going by way of Vicksburg and Jackson, reaching New Orleans at 4.30 p. m. the 1st of May and remaining there until 6 p. m. the following day. On the evening of May 1 the president will attend a banquet and will probably deliver a short address. On the 2d the party will go for a drive visiting in its course the Cabildo, the old building which was the seat of the Spanish and French governments and which witnessed the transfer of sovereignty from Spain to France and from France to the United States. After luncheon a boat ride will be taken on the Mississippi. The next stop will be at Houston, Tex., on the morning of the 3d. Later in the day a stop will be made at Prairie View to accommodate the negro industrial college located there, and from here the train will go to Austin, arriving at 5 in the afternoon, and leaving at 10 for San Antonio, where some hours will be spent the following day. Sunday, the 5th, and Monday morning will be spent in El Paso. From El Paso the party will go by way of Maricopa, Ariz., to Phoenix, reaching there early in the morning of May 7, and remaining until late in the afternoon, devoting part of the time to an inspection of the wonderful system of irrigation which is in operation in the vicinity of Phoenix.

Wednesday morning, May 8, the president and party will arrive at Redlands, Cal., where they will be met by the governor of California and other prominent officials and citizens. Several hours will be spent at Redlands. Los Angeles will be reached in the afternoon, and the party will remain there until the morning of May 10. On Friday Ventura, Santa Barbara and San Luis Obispo will be visited, the train arriving at Del Monte during the night. Saturday and Sunday will be spent at Del Monte, and on Monday morning the train will leave for San Jose, going by way of Santa Cruz, where some hours will be occupied in a visit to the immense red woodtrees, which are found in the vicinity. San Jose will be reached at 2.30 p. m., and the night will be spent there, the party going to San Francisco the following day by way of Palo Alto and Burlingame, arriving in San Francisco at 4.40 p. m., Tuesday, May 14, and remaining until the following Monday.

The president will be met at San Francisco by the mayor and citizens' committee. The program for the stay here includes a public reception at night and a visit on Wednesday to the University of California and Oakland; on Thursday a visit to Mount Tamalpais, and a reception of various societies in the afternoon; Thursday night the president will attend the banquet of the Ohio society; Friday morning a school children's reception will be held, and the president and party will visit Ocean Beach; in the afternoon a reception has been arranged by the Knights Templar. Saturday morning will witness the launching of the battleship Ohio, which is the objective point of the president's trip. Following the launching the party will attend a luncheon at the Union League club, and at night will be held the citizens' banquet. Sunday will be spent in rest, and on Monday morning the party will leave San Francisco for Portland, Ore., stopping about two hours at Stockton, and spending the evening in Sacramento. Brief stops will be made the next day at Redding, Sisson and Ashland, and Salem, Ore., will be reached on the morning of Wednesday, May 22. The party will remain here a few hours, and will reach Portland that afternoon at a little after 2 o'clock.

Thursday morning, the 23d, the president will leave Portland at 9 o'clock for Tacoma, going by way of Chehalis, Centralia and Olympia, stopping about an hour at the State capital, and reaching Tacoma late in the afternoon. The night will be spent in Tacoma, and the following morning a boat trip of several miles will be taken on Puget Sound, ending at Seattle about 2.30 p. m. The remainder of the day the party will stay in Seattle, and late that night will leave for Spokane, going by way of Ellensburg, North Yakima, Pasco, Wallala and Walla Walla. Sunday they will remain in Spokane, and on Monday the president will probably go for a drive and a visit to Spokane Falls. The party will leave Spokane at 2 p. m., and arrive at Butte early the next morning. The morning will be spent in Butte and Helena will be reached late in the afternoon. After several hours in Helena the train will run to Cinnibar during the night, and the following morning the party will be taken by stage to Yellowstone Park. Between two and three days will be spent in the park, and if the weather is favorable a visit will be made to the Canon of the Yellowstone.

Leaving Cinnibar on the evening of Friday, May 31, the president will arrive at Anaconda early the next morning, and a short visit will be made there to the copper mines. From Anaconda the route will be through Idaho by way of Poctello to Salt Lake City, where Sunday, June 2, will be spent. Leaving Salt Lake City at noon on Monday the party will go to Ogden and make a short visit there, leaving at 4 p. m. The following morning Glenwood Springs, Col., will be reached and a few hours will be spent here, the train leaving sufficiently early to reach the Royal Gorge before dark and arrive at Denver early the next morning. It is expected that the train will reach Chicago about 3.30 p. m., and the president will probably attend a banquet there that evening, leaving at night for Buffalo, where he is to visit the Pan-American Exposition. Thursday, the 13th, will be spent at the exposition, and late in the afternoon the party will go to Niagara Falls, remaining there the following day, leaving Friday night at 10 o'clock, and returning to Washington by way of the Delaware Water Gap and Philadelphia. The time set for reaching Washington via the Pennsylvania railroad is 5 p. m., Saturday, June 5.

The total distance travelled will be about 10,500 miles, crossing twenty-three states and two territories, and touching the Gulf of Mexico, the Pacific ocean and the great lakes. Twenty-seven railroads are embraced in the itinerary. Wherever feasible the state capitols are visited. Local programs are arranged covering the cities at which extended stops are made. A feature of the trip will be the substitution of drives for receptions, thus more fully accommodating the people than would be possible at a short reception. The reception committees will be received at the cities they represent, the various local committees having cordially cooperated in this respect, as well as in others, in an endeavor to make the journey of the president and his party a most enjoyable and interesting one. While the president may make short addresses at several of the large cities and at some of the colleges and universities, it is not at all likely that he will make as many speeches as have been delivered in the course of previous trips.

Settlers' rates via the Nickel Plate road—Beginning with Tuesday, Feb. 12, low rate settlers' tickets will be on sale every Tuesday to and including April 30, to Oregon, Montana, Washington and all points in the Northwest. Write, wire, 'phone or call on the nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O.

10 April 30.

SEASON OUTLOOK AT BUFFALO.

Buffalo, April 17.—The spring opening of the lakes is not dependent on the disappearance of the ice this year and is attended with some new and doubtful conditions, both general over the lakes and local to Buffalo, as well as elsewhere. Vessel owners here profess to believe that the striking engineers, who are making a general opening impossible at present, will go to work in response to a general call, but the evidence that this is true is small thus far. It is a fact that there are quite a number of engineers at work here, and specially at Tonawanda, but they are mainly connected with the lumber fleet, which is not very much concerned in the demands made by the strikers. It is expected, though, that some solution will be reached this week.

Buffalo marine men are much disturbed over the refusal of the upper house of the city council to ratify the vote of the lower house to use $400,000 in dredging out the harbor and making it as deep as the other ore-receiving harbors on Lake Erie. Had the discrimination of 5 cents a ton in ore freights been made against this port at the time the adverse vote was taken it might have been different, and there will be an effort to secure a reversal of it now. The strange part of the whole transaction appears to have been that the board of councilmen contains two veteran marine men, both of whom took violent sides against the measure. It is expected that as soon as the new furnaces at the steel plant at South Buffalo are running, which will be sometime this fall, all of the ore for Scranton will be taken there. It happens, though, that this ore is taken in the Erie basin by the Lackawanna road, where there is plenty of water. So the problem of sufficient water to reach the Minnesota docks and the furnaces in the inner harbor remains unchanged and all effort will be made to secure the desired harbor deepening. The loss of ore business and the extra cost of all that is obtained is something not to be ignored.

Otherwise the Buffalo spring situation is favorable. There is the utmost confidence in the grain handling plan, the elevator pool will be re-established, the tug war is probably over, and receipts and shipments will be large. The package freight lines are especially eager to get started on account of the amount of west-bound business expected. A better rate than usual has been made and there appears to be a better understanding among the lines and the all-rail lines than usual and no disturbing element exists.

There is a queer condition of things in the effort to combine the vessel interests on an all-season rate for coal to the upper lakes. The idea is generally favored in the abstract, but it is felt that it will be very hard to carry it out. Vessel owners have never been able to combine on rates, and as soon as one of them shows evidence of bad faith the agreement will be at an end. Even agreements on sailing dates at the opening of the season seldom amount to anything. I asked a marine man the other day if he had any idea that so-and-so could be depended on to keep such an agreement, and he replied that he positively knew of several owners who had gone into the agreement in order to be posted on the proper time for pulling out. Then certain of the larger owners have stayed out and will make it uncomfortable for the combine. So far as learned the hard coal shippers are agreed to the idea, for it gives them a cue to prices from the opening of the season, which they have never had before. Buffalo is for the most part standing on the dock, waiting to see whether it seems worth the while to take passage or not. Combination is the rule of business these days, but there are elements that will not combine, for all that.

JOHN CHAMBERLIN.

NEW SUBMARINE BOAT.

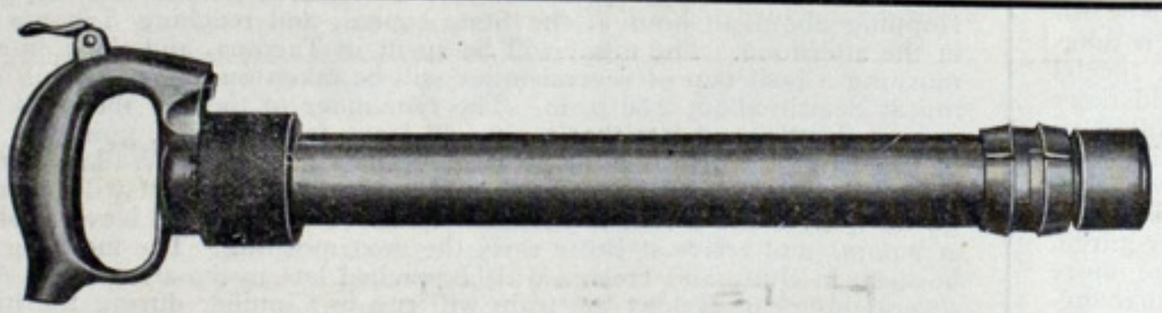
Designs for a submarine or subaqueous boat will be prepared by the naval board of construction and submitted with an estimate of its cost to the next session of congress. Secretary Long, upon the recommendation of Rear Admiral A. S. Crowninshield, chief of the bureau of navigation, has directed the board to submit plans and data concerning submarine boat construction. This action is of the utmost importance, as it means that the navy department will continue its vigorous opposition to the efforts of the Holland Submarine Torpedo Boat Co. to secure legislation directing the construction of additional Holland boats.

The boat which will be designed by the board of construction will probably not be of the submerged type, but of the subaqueous type, and will make a speed of at least 16 knots per hour. Information obtained regarding the resistance to the propulsion of a submarine boat shows that without the expenditure of enormous powers, it is difficult to get a speed of more than 3 or 4 knots under water. It is the idea of the members of the board on construction that a boat which will run awash will be as difficult of detection as a submarine boat, can be steered without trouble and accurately discharge its torpedo at a target. Besides the greater speed that can be attained by a wholly submerged boat will be greatly in favor of the design advocated by members of the board.

The Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y., have completed plans for a mammoth steel building for their plate works. They are also setting their new steeel rollers in position, the largest of which is 31 in. in diameter, and its length will allow the working of steel plates 26 ft. in length.

Scott's Coast Pilot, revised for 1901, has just been issued. This addition, the sixth, contains several valuable improvements over old issues. It is a publication especially valuable for young men who are seeking a master's position on the great lakes. The book may be had from the Marine Review for $1.50.

Thomas Lynch, president of the H. C. Frick Coke Co., has been elected by the directors of the United States Steel Corporation as general manager of the coal and coke properties of the constituent companies, with headquarters in Pittsburg.



Some Pneumatic Tool Talk.

Don't be fooled by any "just as good as **'Little Giant'** " talk—that's the tribute other makers unwittingly pay to **"Little Giant"** superiority. "Just as good" means taking chances—larger repair bills, smaller profits. If the other fellow's "just as good" was really just as good he'd say it was better. You know that.

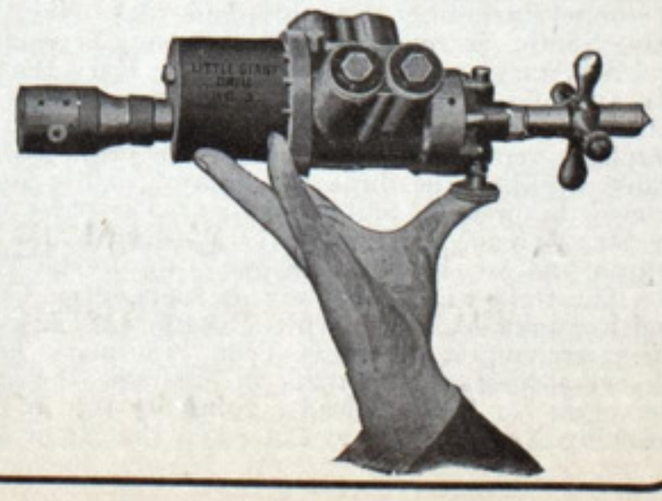
Now, there's our Long Stroke Hammer; where is there anything to compare with it? It's the latest and best Long Stroke Hammer on the footstool. It has no vibration, and it does the biggest day's work in a day without making the operator feel at night as though he'd been hanging on to the tail end of a full grown cyclone for ten hours. It drives rivets perfectly up to 1 in. It has only three moving parts. No other Hammer has so few.

If you want a smaller Hammer for chipping, calking, beading, etc., one of our seven sizes will fill the bill. You know all our Hammers have a regulator that lets in the air just as it's wanted and every one of them cushions on exhaust air, saving fully 30 per cent. over hammers that cushion on live air.

They're simple, too, and have no delicate parts.

Then, there are Pneumatic Drills. We make the only Piston Air Drills having a double-balanced Piston Valve cutting off at 5/8 of full stroke, and these Drills can be operated in a bath of oil, because the exhaust doesn't come in contact with the working parts. They're made entirely of steel, are economical in the use of air, and they stand the racket. **"Little Giant"** tools have met with the pleased appreciation of good mechanics all over the world, and have, through sheer merit, become the standard for comparison in representative shops of all sorts where pneumatic tools are used.

We send any "Little Giant" Tool anywhere for a free 30 days' trial.
We guarantee every "Little Giant" Tool for one year.



STANDARD PNEUMATIC TOOL COMPANY,

Manufacturers of Pneumatic Drills, Hammers,
Reversible Flue Rolling, Reaming, Tapping and Boring Machines,
and all kinds of Air Tools and Appliances.

Ask for Catalog "E"
It's free.

Main Offices, Chicago, Ill.
New York Office, 141 Broadway.

BIG NEWPORT NEWS DOCK WILL SOON BE READY.

Newport News, Va., April 17.—Tests of the new dry dock at the works of the Newport News Shipbuilding & Dry Dock Co. here have been about completed and the immense basin comes up to the most sanguine expectations of the company. With the exception of one small leak in the bottom, which was quickly disposed of, the construction seems to have been perfect. The pumping machinery was also thoroughly tested and was found to be satisfactory in every respect.

Dredges are now busily engaged in cutting away the channel leading up to the cofferdam surrounding the mouth of the dock. This work will occupy about a week, at the end of which time the immense basin will be ready to receive its first ship. It has not yet been decided whether the battleship Illinois will have this honor or not. If she is not the first vessel to go in for a scraping preparatory to going off on her official trial, it is possible that the Pacific Mail liner Corea will be the first vessel to go in.

An interesting feature in connection with the completion of the dock was the placing of the immense caisson in position across the mouth of the dock. The caisson was constructed in the dock near the inner end of the basin. When the dock was first flooded the caisson was floated down to the entrance and placed in position. This ticklish piece of work was accomplished without accident.

An interesting event took place at the ship yard here one day last week. The North German Lloyd steamer Main, a very large vessel which is being rebuilt here, was turned around at her dock. The foremen have desired to accomplish this feat for some time, but have been afraid that the scant structural strength of the ship in her present condition would make the task dangerous. They concluded to undertake the job one day last week, however, and four tugs were pressed into service to turn the great vessel. Work on the Main is progressing rapidly, a good deal of the dented and damaged steel on the sides having been replaced, while two of the decks have been reconstructed. The vessel will be practically new when she leaves this yeard.

W. F. L.

TRADE NOTES.

The St. Louis office of the Bethlehem Steel Co. has been removed from 930 N. Main street to 510 Security building in that city, where Mr. S. E. Freeman will continue in charge.

The Atlantic Works, Incorporated, of Philadelphia, a few days ago shipped to Washington a 40-in. band saw machine and a large self-feed saw bench to be used in the model basin department at the Washington navy yard.

The Graphite Lubricating Co., Bound Brook, N. J., have issued a catalogue explanatory of their graphite and bronze bushings. All kinds and shapes of revolving and sliding friction surfaces have been provided for by the company's method of lubrication. The company makes bushings or bearings that at high or low speed will run without oil or grease in a great majority of cases.

The Boston & Lockport Block Co., 142 Commercial street, Boston, have issued a little catalogue setting forth in tabulated form the war tax changes which are to take effect on July 1. The principal modification is, of course, the repeal of the stamp tax upon checks, drafts, bills of lading, express packages and telegrams. The company will send a copy of the catalogue to anyone who may ask for it.

The American Pressed Steel Co., No. 601 Witherspoon building, Philadelphia, have issued a catalogue devoted to their "Never-Slip" patented wrought steel and iron floor plates. These plates have been recommended by architects, engineers, ship builders, contractors and others, for factories, office buildings, war and merchant ships and gutter crossings and all inside and outside work where a roughened surface is required or desirable to guard against slipping.

The Marine Review presents its compliments to Edward Smith & Co., No. 45 Broadway, New York, for the rare taste displayed in a little booklet entitled "The Man at the Wheel." It is illustrated with exquisite photographs and wash drawings of the cruiser Brooklyn, the Atlantic liner St. Louis and ship yard scenes. The catalogue is a very attractive advertisement of the company's spar coating, which is indorsed by the Herreshoff Manufacturing Co., the Bath Iron Works, International Navigation Co., Walter Coleman & Sons and others.

The Protectus Co., No. 1108 and 1109 North American building, Philadelphia, manufacturers of preservatives for metal and wood, have issued a neat little catalogue of twelve pages devoted to their products. Their leading product is protectus, which is described as a preservative for metal and wood, which, when applied like paint, sets to a durable, elastic coating, under which is deposited, by natural precipitation, a dense film. It expands and contracts with the temperature, remaining unaffected by atmospheric gases, heat or cold. It is impervious to moisture and will not absorb or impart oxygen. It protects iron and steel against rust or corrosion. It also preserves wood from decay. The company also makes wood cleaners and stains.

Mr. A. E. Walden, superintendent of the Elmira Water, Light & Railroad Co. of Elmira, N. Y., says in a letter of recent date to the Buffalo Forge Co. of Buffalo, N. Y.: "In reply to yours of April 2, will say that we are very much pleased with your direct connected fan outfit for forced draft purposes at our lighting plant. Our saving on the first month's run with this apparatus in use amounted to 175,000 lbs. of coal, and on this test for increasing the capacity of our boilers we found that with a fan one 250 H.P. water tube boiler developed on a continuous run of ten hours a little over 600 H.P., and while we do not advocate forcing the boilers to any such extent, it simply shows what can be done in this line in case of necessity." The apparatus in question consists of a Buffalo standard steel plate 80 in. fan with direct connected 5x5 Buffalo single vertical class "A" engine, serving two 250-H.P. boilers.

Petty's island, Camden, N. J., has just been purchased for manufacturing purposes and the buyers are said to represent English capital. Parties are also negotiating for a strip of land 1,300 ft. long on the Camden shore opposite the island, owned by Peter Hagan. It is understood that they want the land to be used in conjunction with the island for ship building purposes. There is, however, nothing definitely known as to the purposes for which the land is wanted.

BELLEVILLE GENERATORS

Grand Prix 1889
Originated 1849

Hors Concours 1900
Latest Improvements 1896

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890	67,728	2,460										
1891	68,247	68,331	204									
1892	68,247	68,403	69,822	23,259								
1893	68,379	68,343	68,286	68,247								
1894	68,439	68,367	68,574	68,439	37,701							
1895	68,673	68,766	68,739	68,808	40,887	28,713						
1896	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

ATELIERS ET CHANTIERS DE L'ERMITAGE, À ST. DENIS (SEINE), FRANCE.
WORKS AND YARDS OF L'ERMITAGE AT ST. DENIS (SEINE), FRANCE.

TELEGRAPHIC ADDRESS: BELLEVILLE, SAINT-DENIS-SUR-SEINE.

LIFE SAVING DEVICES.

The invention of some means of ensuring the safety of life at sea, in the event of disaster, has engaged attention for many years, and numerous, indeed, have been the suggestions offered. There still remain, however, but three really practicable devices for the object in question—the lifeboat, the lifecar, and the English buoy. The lifeboat is the main reliance of a distressed crew at sea; the lifecar and English buoy are employed by the United States life saving service and the efficacy of the former may be judged from the fact that, on its first trial, just fifty years ago last January, at Squan Coast, N. J., it was instrumental in saving 201 lives. This identical car is doubtless familiar to persons who have visited at the national museum. The little gun used on that occasion in carrying the life-line to the distressed vessel and the shot fired to the latter have been sent to the Buffalo exposition. A singular circumstance in this connection is that the wreck lay buried in the sand for over twenty years when, after a peculiarly heavy storm, it was found fully disclosed to view and the shot and portions of the hawser and life-line were obtained.

The self-bailing lifeboat is said to have been invented by an English coachmaker about 115 years ago. It is a simple device. Its deck is placed above the water line and is pierced with openings which connect by tubes directly with the surface water beneath. When the boat becomes swamped the tubes drain off the superincumbent liquid, which, of course, immediately seeks its level. In addition, the boat is provided with air-tight compartments, which keep it afloat and protect it from the danger of being crushed by the force of the waves. The lifeboat is efficient in seas where it can be launched. The English buoy is worked upon the same principle as the life-car, being drawn on an overhead hawser through the surf. It may be described as a large bag, the upper portion of the occupant's body being exposed. In establishing a connection between the shore and a vessel in distress, the life-line, a thin but strong rope is first attached to a shot, which is then fired from a mortar. The line, being thus received on board the vessel, is passed through a pulley and its extremity returned to shore in the same manner in which it was received. A cable, or hawser, is then fastened to the life-line and drawn by means of the latter, both ends of which may be worked from the station on shore, to the ship, where it is securely fastened. The life-car or buoy is then run along the hawser, the land end of which is alternately raised or lowered to allow for the passage of the apparatus to or from the ship.

The great importance of an official recognition and endorsement of life-saving devices led to the establishment, by this government, of a board of experts for the examination of inventions designed for use at United States life-saving stations. The necessity for such a board was admirably illustrated in the instance of the Norton lifeboat, to which a tragic history is attached, more appalling than that of the inventor and builder of the first Eddystone light-house, who, confident of the efficacy of his structure, perished therein upon the night of a terrible storm. The Norton boat, after a thorough and careful investigation by the board of the life-saving service, was rejected as unworthy. Hereupon Capt. Norton, to demonstrate the efficacy of his invention and the fallibility of the government experts, embarked, with his wife and niece, Miss Annie Richerby, and seven other persons upon his frail-looking craft for a voyage across the Atlantic ocean. They left New York Nov. 24, 1890, and were nevermore heard of. Capt. Norton was president of the Norton Naval & Ship Building Co. of New York.

A great many devices have been invented by persons who, however praiseworthy their motives, would seem lamentably deficient in a practical knowledge of the ocean and its terrors. Many such appliances would answer admirably upon the placid bosom of a river or small lake, and then only for a brief period. Thus there have been patented inflated suits, life rafts, and the like, without number, but their originators seem to have little idea of the power of a heavy sea or the difficulty of sustaining life for any length of time in a cold element. There have been safety sofas, chairs, and the like, upon which a shipwrecked person could recline at ease in the water. One thoughtful genius provided, in a safety suit, for the stowage in a convenient pocket of a bottle of alcoholic stimulants, use of which in such a situation could scarcely be objected to by Mrs. Nation herself. Many of the inventors of such devices reside in inland districts, and, in all probability, never saw the ocean in their lives.

A QUESTION OF BOILER COVERING.

General publicity was given recently to a circular sent out by the Keasbey & Mattison Co. directing attention to suit brought against the Philip Carey Mnfg. Co. of Lockland, O., to restrain them from making and selling magnesia covering for boilers and steam pipes containing more than 50 per cent. of magnesia, and especially coverings containing 85 per cent. of magnesia. The Philip Carey company is a very large concern and has recently been making magnesia covering on an extensive scale. The Keasbey & Mattison circular requested users of steam pipe and boiler covering to refrain from making purchases of the Philip Carey company, as it was stated that "such purchases must of necessity lead to suit." In view of the attention that has been directed to the circular, Mr. A. E. Brown, who represents the Philip Carey company in Cleveland, and who has of late been furnishing a large amount of this kind of material to ship builders and ship owners in different parts of the lakes, directs attention to the fact that his company stands ready to furnish to customers any kind of protection that is desired on account of the legal action. New vessels of the Gilchrist fleet, ships building at Port Huron and several vessels already in commission but which require covering are being supplied by the Philip Carey company.

U. S. Engineer Office, Duluth, Minn., April 5, 1901. Sealed proposals will be received here until noon, April 20, 1901, and then publicly opened, for furnishing and placing riprap at Duluth ship canal. Information on application. D. D. Gaillard, Capt., Engrs.
April 18.

U. S. Engineer Office, 57 Park St., Grand Rapids, Mich., April 10, 1901. Sealed proposals for Dredging at Harbors on East Shore of Lake Michigan will be received here until 3 P. M., April 25, 1901, and then publicly opened. Information furnished on application. Chester Harding, Capt., Engrs.
April 18.

U. S. Engineer Office, Customhouse, Cincinnati, O., March 22, 1901. Sealed proposals for hire of Towboat having cylinders about 14 inches diameter, with 5 feet stroke, to serve as tender for Ohio River Dredges during present season, will be received here until 2 p. m., April 26, 1901, and then publicly opened. Information furnished on application. Wm. H. Bixby, Maj., Engrs. Apr 18.

"Seaboard Steel Castings."

MANUFACTURERS OF
"THE ADMIRAL" ANCHOR.

THE LATEST AND BEST STOCKLESS ANCHOR.
APPROVED BY LLOYD'S.

ANCHORS CAST AND TESTED ON ORDER, OR STOCK ORDERS PROMPTLY FILLED.

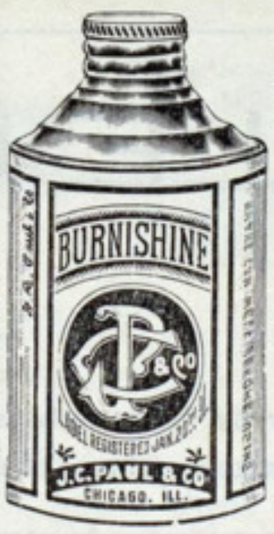
A GUARANTEE OF QUALITY.

OPEN-HEARTH STEEL CASTINGS OF THE HIGHEST GRADE.
FACILITIES FOR CASTINGS UP TO 80,000 POUNDS WEIGHT.
MACHINE WORK AND PATTERNS FURNISHED WHEN REQUIRED.
RAIL OR WATER DELIVERIES.
CAPACITY, 1500 TONS PER MONTH

Seaboard Steel Casting Co.,
CHESTER, PA.

BURNISHINE.

THE MOST MARVELOUS METAL POLISH IN THE WORLD.



In Liquid and Paste Form.
Will Polish
Hot or Cold
Metal,
no matter which.

Produces a wonderfully brilliant lustre on brass, copper, nickel and all metals, no labor required.
Used on steamers all over the world.
Free samples on application.

J. C. PAUL & CO.
57 Dearborn St., CHICAGO, ILL.

Engineers

in every section of the world should interest themselves by

Getting in touch with us.

We know that we can be of service to you if you will write us your wants as regards PACKINGS for your valve rods, pistons, etc. We are the manufacturers of

Garlock's HIGH-GRADE Packings

for every purpose, and can assure you they are the best, being made of superior material, and are of the finest workmanship. Let us know your requirements and we absolutely guarantee to supply your wants. Address our nearest office and you will receive our prompt, careful and best attention.

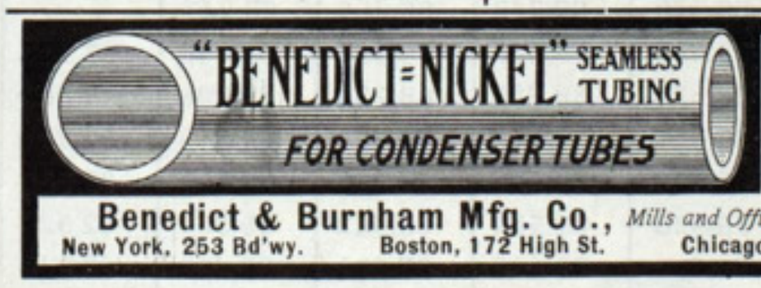
Send for catalogue and samples to our nearest office.

THE GARLOCK PACKING CO.

NONE GENUINE WITHOUT IT.

New York. Philadelphia St. Louis.
Boston. Pittsburg. Denver.
Chicago. Cleveland. San Francisco.

MAIN OFFICES AND FACTORIES:
PALMYRA, N. Y.; ROME, GA.



Contains NO ZINC nor any weakening metal.
Send for Booklet with treatise on "Electrolysis of Condenser Tubes."

Benedict & Burnham Mfg. Co., *Mills and Offices*, Waterbury Conn.
New York, 253 Bd'wy. Boston, 172 High St. Chicago, Cor. Lake & Clark Sts.

LUMBER SCHOONER FOR SALE.

A first-class lumber schooner of 275,000 ft. capacity cheap for cash. Address Wm. E. Barrett & Co., Grand Rapids, Mich. May 9.

FOR SALE OR CHARTER.

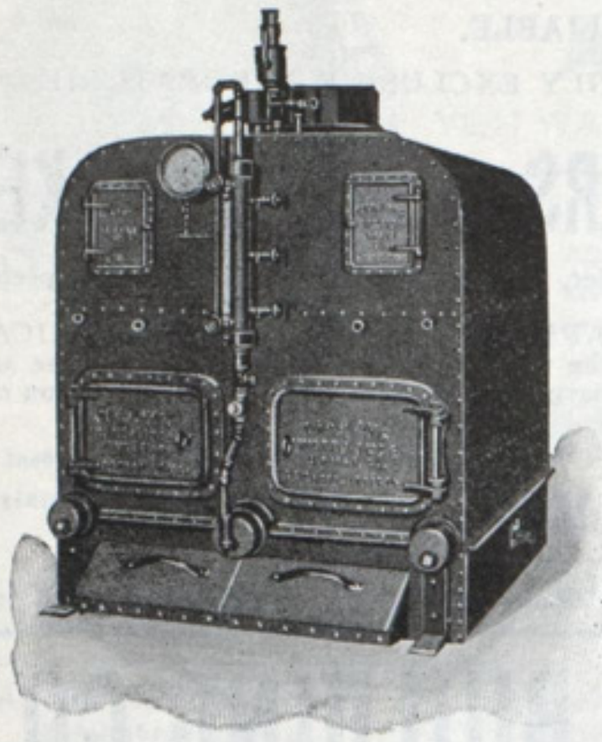
First-class British steamers, of Welland canal dimensions; about 3,250 gross tons capacity, carrying about 2,000 gross tons on 14 ft. (fresh water) draught. Speed 10 knots loaded; easy consumption. Large hatchways. For further particulars address "Charter," The Marine Review Pub. Co., Perry-Payne Bldg., Cleveland, Ohio. May 2.

Five Electric Passenger Launches For Sale.

In fine condition. Length over all, 35 feet. Seating capacity, 28. Send for price list. Yacht brokers, please note. Milwaukee Electric Launch Co., 1504 Monadnock Block, Chicago. tf

SIDE-WHEEL TUG FOR SALE.

Length 66 ft., depth 5 ft. Boilers new. Machinery in good state of repair. For further particulars address The I. Stephenson Co., Wells, Delta County, Mich. April 25.



FUEL ECONOMY.

October 31, 1899.

Dearing Water Tube Boiler Co., Detroit, Mich.

Gentlemen:—The boiler we purchased of you about three years ago has been in service now three seasons, and has given entire satisfaction. It is an easy steamer and very economical in fuel, and we can cheerfully recommend it to any one wishing a boiler.

Yours very truly,

THE CARL ANDERSON CO.
General Machinist.

The heating surface is so proportioned as to be at right angles to the heat rising from the grates.

The heat is evenly distributed direct through the generating tubes, thus ensuring great fuel economy and a quick generation of steam.

THE DEARING WATER TUBE BOILER

is the most compact, most simple, most economical marine boiler made.

Our catalog gives full particulars. Write for it.

Dearing Water Tube Boiler Co.,

DETROIT, MICH.

STANDARD SEAMLESS TUBE CO.

MANUFACTURERS OF

Seamless Cold Drawn Steel Tubing

IN ALL SIZES FROM 1/8 TO 16" DIAMETER.

Stay Tubes,
Water Grates,
Compressed Air and
High Steam Pressures.

Boiler Tubes
FOR ALL CLASSES
OF MARINE WORK.

Hollow Shafts,
Bushings,
Hydraulic Tubes,
Etc., Etc.

NATIONAL TUBE COMPANY,

SELLING AGENTS,

SALES OFFICES:

Havemeyer Building, New York.
Conestoga Building, Pittsburg.
Western Union Building, Chicago.
95 Milk St., Boston.
267 So. Fourth St., Philadelphia.
420 California St., San Francisco.

FOREIGN OFFICE:
Dock House, Billiter Street,
London, E. C., Eng.

Dearborn Vegetable Boiler Compounds.

SCIENTIFICALLY AND UNIFORMLY MADE. EVER RELIABLE.

Most Scientifically equipped, Complete, Handsome and expensively Furnished Laboratories, and the ONLY EXCLUSIVE LABORATORIES ON STEAM ECONOMY in the Country.

MARINE FORMULA NO. 5, For the WATERS of the FIVE LAKES.

To prevent pitting, neutralize the oil, stop incrustation, and as a perfect preservative to the iron, boiler, and all its connections—especially prepared for the marine trade of the lakes.

If you are using a different water, prepay the express on a gallon jug of your feed water to the DEARBORN LABORATORIES at CHICAGO and receive a copy of analysis of same, with a written diagnosis of your case, and a letter giving you all the valuable information we can, and the actual cost of what it will require to clean your boilers and keep them clean. All of this will be done free of charge, and optional with you whether you order or not. When in Chicago call and inspect our Laboratories.

Analyzers of Everything.

Makers of Boiler Compounds.

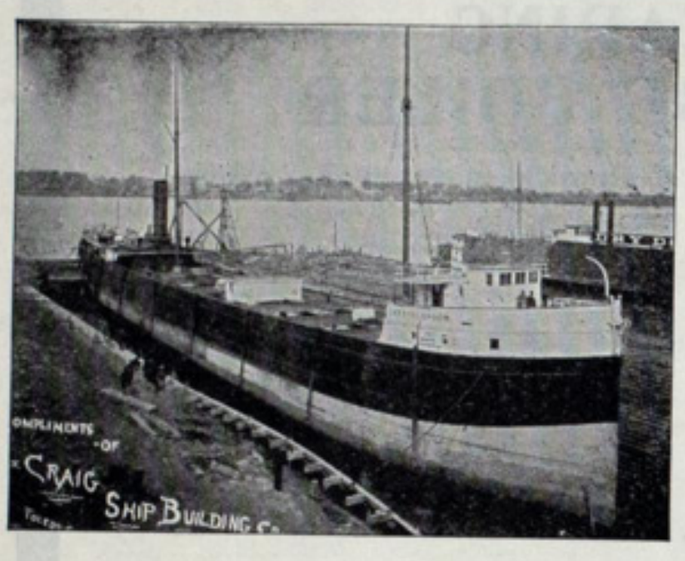
DEARBORN DRUG & CHEMICAL WORKS

CHICAGO

WM. H. EDGAR, President.

Manufacturing and Analytical Chemists.

OFFICES: 29, 30, 31, 32 and 33 Rialto Building. Telephone, Harrison, 1373. WORKS: 23, 25, 27 and 29 La Salle Street. Telephone No. 1130 South.



CRAIG SHIP BUILDING CO.

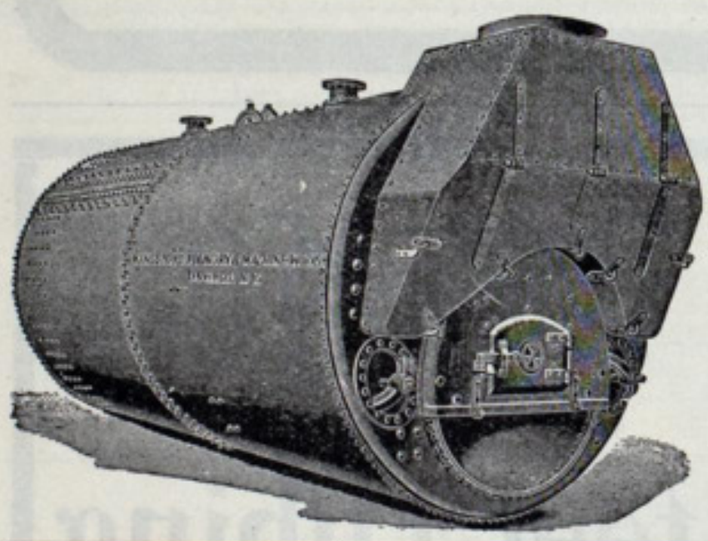
TOLEDO, OHIO,

METAL & WOODEN SHIP BUILDERS.

New Dry Dock—450 feet long, 110 feet wide on top, 55 feet wide on bottom, 16 feet of Water on Sill.

Repairs to Metal and Wooden Ships

A SPECIALTY.

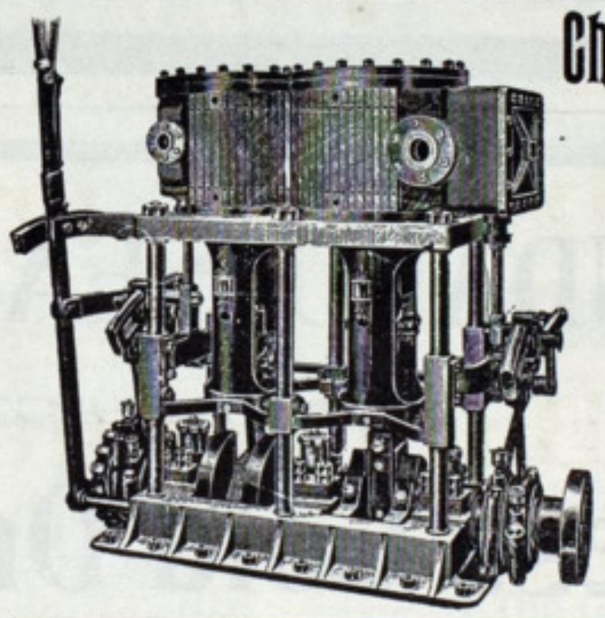


Marine Boilers.

Centrifugal Pumping Machinery for all Purposes.

Kingsford Foundry and Machine Works,

OSWEGO, N. Y.



Chas. P. Willard & Co.

F. C. WALTER, Manager.

45-49 S. Canal St., CHICAGO.

BUILDERS OF

Marine Engines and Boilers,
Paddle Wheel Engines,
Boat Machinery,
High Pressure, Compound and Triple Expansion Engines,
Yachts and Launches.

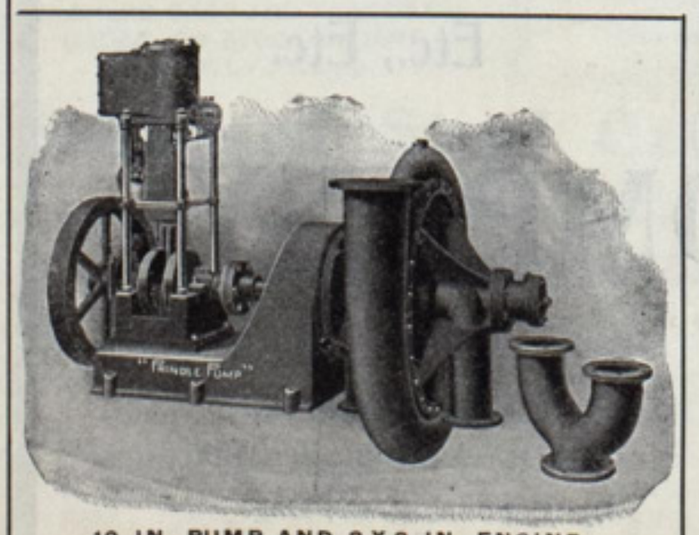
WRITE FOR CATALOGUE.

R. D. WOOD & CO., 400 CHESTNUT ST., PHILADELPHIA.

CENTRIFUGAL PUMPS

DIRECT-CONNECTED TO

STEAM ENGINE OR ELECTRIC MOTOR.

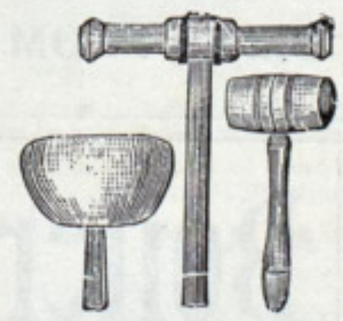


10 IN. PUMP AND 8X8 IN. ENGINE.

UNEQUALLED FOR

MARINE SERVICE.

Circulating Water for Condensers,
Bilge Water Drainage,
Dry Dock Service,
Dredging, Wrecking, &c.



WE ARE THE INVENTORS OF THE

CAULKING MALLETS

NOW USED IN ALL THE SHIP YARDS OF THE WORLD.

Specialties: Boiler Makers' Mauls, Stone Cutters' Mallets, Hawsing Beetles, and all kinds of Mallets.

Illustrated Catalogue and Price List upon application.

N. Y. MALLET & HANDLE WORKS,

Established 1845.

454 E. Houston Street, NEW YORK, U. S. A.

BARGAINS IN BOOKS.

AS LEADERS IN OUR BOOK TRADE WE WILL ALLOW FOR A SHORT PERIOD A DISCOUNT OF 25 PER CENT ON THE FOLLOWING BOOKS. LISTED ON PAGE 35 OF THIS ISSUE OF THE REVIEW:

A Library of Steam Engineering—Fehrenbatch.
Gas and Oil Engines—Richmond.
Slide Valves—MacCord, Jr.
A Handbook of Engineering Practice—Smart.
Modern Examinations of Steam Engineers—Wakeman.
Theoretical and Practical Ammonia Refrigeration—Redwood.
Elementary Naval Tactics—Bainbridge-Hoff.

THE MARINE REVIEW PUB. CO., CLEVELAND, O.

"THE ORIGINAL AMERICAN" IS THE ONLY GENUINE

ASBESTO-METALLIC PACKING.

YOU WANT OUR GOODS—SEE THAT YOU GET THEM—THE BOX LOOKS LIKE THIS

This Packing is unequalled for marine use. Will stand very high pressure and will not scratch, gum or corrode the rod. It is made of the best material.

SEND FOR COMPLETE CATALOGUE AND PRICE LIST.

AMERICAN STEAM PACKING COMPANY,

60 FEDERAL STREET, BOSTON, MASS., U. S. A.

47 DEY STREET, NEW YORK. 892-394 Mission St., San Francisco. Western Depot—55 So. CANAL ST., CICAGO, ILL.

MARINE VALVE MINERAL SEAL — DARK LUBRICATING, ELDORADO ENGINE — RENOWN ENGINE, HEAD LIGHT — VICTOR SIGNAL, CRANK CASE — LARD OILS

AND

ARCTIC CUP GREASES

MARINE VALVE OIL FOR INTERNAL LUBRICATION.

CARRIED IN STOCK BY THE

STANDARD OIL COMPANY,

5 WABASH AVENUE, CHICAGO, and 123 RIVER STREET, CLEVELAND.

RENOWN ENGINE OIL FOR EXTERNAL LUBRICATION

ALSO FOR SALE BY

STANDARD OIL COMPANY,

Muskegon, Mich. Racine, Wis. Milwaukee, Wis. Sheboygan, Wis. Manistee, Mich. Manitowoc, Wis. Green Bay, Wis. Buffalo, N. Y. Ludington, Mich. West Bay City, Mich. Detroit, Mich. Escanaba, Mich. St. Ignace, Mich. Ashland, Wis. Kenosha, Wis. Marinette, Wis. Oshkosh, Wis. Duluth, Minn. West Superior, Wis. Hancock, Mich. Marquette, Mich. Sault Ste. Marie, Mich. Saginaw, Mich.

ATLANTIC REFINING CO., Erie, Pa.
D. ROBESON, Port Huron, Mich.
W. S. McKINNON, Ashtabula Harbor, O.
HENRY HULL, Lorain, O.
LAKE ERIE SUPPLY CO., Conneaut, O
BABY & DALE, St. Clair, Mich.
N. C. ALTEN, Lorain, O.
A. F. HARRINGTON, Conneaut, O.
CHAPMAN & HILLS, Lorain, O.
HARBOR SUPPLY CO., Ashtabula, O.
SCOTT BROS., & DeLISLE, Marine City, Mich.
MARINE SUPPLY CO., Fairport, O.
THE M. I. WILCOX CO., Toledo, O.
SO. CHICAGO SHIP CHANDLERY CO., So. Chicago.

Pintsch Gas Lighted Buoys

Adopted by the English, German, French, Russian, Italian, and United States Light House Departments, for Channel and Harbor Lighting; over 1000 gas buoys and gas beacons in service.

Burn Continuously from 80 to 365 days and nights without attention, and can be seen a distance of six miles.

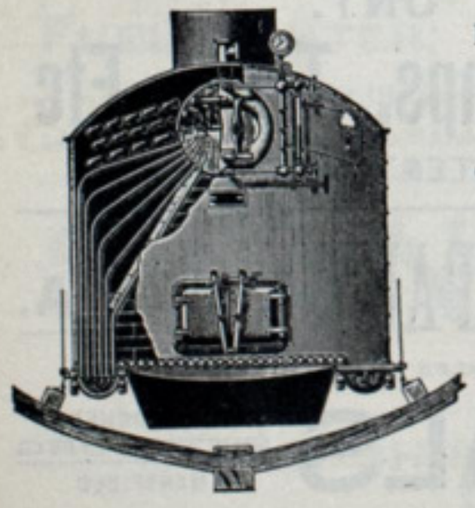
Brilliant and Steady Illumination.
Economical and Reliable in Operation.

Controlled by the **SAFETY CAR HEATING AND LIGHTING CO.,**
160 Broadway, New York City.

SEABURY'S

Safety Water Tube Boiler

For all types of Steam Vessels and Stationary Plants.



Reliable, Safe, Durable, Compact, Light Weight, Economical, Easily Managed.

Tubes may be readily cleaned, internally or externally.

Marine Engines,

STEAM and SAIL YACHTS,
THE ONLY NAPHTHA LAUNCH.

Gas Engine & Power Co. and **Charles L. Seabury & Co.** Consolidated.

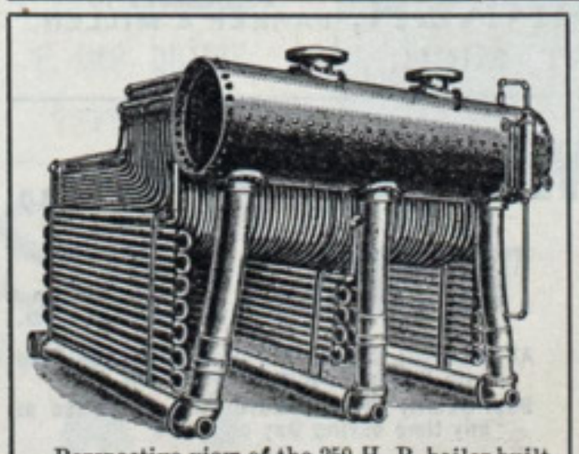
MORRIS HEIGHTS, NEW YORK CITY.

M. W. Fogg,

MANUFACTURER OF
HAIR AND FELT
MATTRESSES, CUSHIONS
AND BEDDING.

20 Fulton St., Cor. Front,
NEW YORK CITY, U. S. A.

Send for Illustrated Catalogue.



Perspective view of the 250 H. P. boiler built for steamboat Clara, having 6 feet face and 8 feet length; 37 7/9 square feet of grate area and 1900 square feet heating surface. Weight of boiler and water, 14,000 lbs.

WE CLAIM for the Boyer Sectional Water Tube Boilers, that they are of an entirely new design, are simplest in construction, are accessible to all parts, are rapid steamers with short circulation, have low center of gravity, have no joints in the fire, have no dead ends, occupy less space in width, length and height than any other, are easily fired, can be repaired or set up by any ordinary mechanic, do not require a brick casing, and are shipped whole or knocked down into packages for transportation by man or beast.

The Boyer Water Tube Boiler Co.,

90 Wall Street, NEW YORK.

MENTION THIS PAPER.)

GEORGE STRATFORD OAKUM CO.,

MANUFACTURERS OF

Oakum, Plumbers' Spun and Marine Oakum and Spun Cotton.

OFFICE AND FACTORY:

CORNELISON AVENUE, JERSEY CITY, N. J.

Steamboat Fuel at Ashtabula.

LARGE SUPPLIES OF BEST QUALITY.

Lighter Carrying Different Grades at all Times.

Fuel scow with elevators and discharging spouts. Storage of 650 tons. Discharges 150 tons an hour into steamers while unloading cargo.

M. A. HANNA & CO., Miners and Shippers. Main Office, Perry-Payne Bldg., Cleveland

---

A. A. & B. W. PARKER, SUCCESSORS TO PARKER & MILLEN,

DETROIT, MICH.

Pickands, Mather & Co.,

FUEL LIGHTERS AT BUFFALO, ERIE, ASHTABULA AND CLEVELAND.

AT DETOUR, MICH., A FUEL DOCK equipped with Shute capacity of 600 Tons.

Best Quality PITTSBURGH COAL furnished at any time during Day or Night.

Western Reserve Building, CLEVELAND, O.

Sterling, Welch & Co.

IMPORTERS, WHOLESALE AND RETAIL DEALERS IN

Carpets, Curtains and Upholstery Goods

OF EVERY DESCRIPTION.

An extensive assortment of the Newest and Choicest Styles of the best foreign and home manufacture, and for sale at the lowest market prices.

SPECIAL CONTRACTS MADE IN FURNISHING Boats, Yachts, Etc.

An inspection of our establishment and stock is earnestly solicited.

12 and 14 Euclid Avenue, CLEVELAND, O.

The Williams & Rodgers Company,

Superior and Seneca Sts., CLEVELAND, O.

WE MAKE A SPECIALTY OF FITTING OUT BOATS

Carpets, Rugs.
Furniture,
Curtains,
Bedding,

AND ALL OTHER FURNISHINGS USED IN CABINS.

SPECIAL RATES TO THE MARINE TRADE.

Bring your Boat wants and your family wants to this store, and we'll take the very best care of you. Dry Goods, Housefurnishings, Carpets, Furniture, and all other articles found in a first-class Dry Goods House.

THE WILLIAMS & RODGERS COMPANY,

CLEVELAND, O.

The Erie & Western Transportation Co. ANCHOR LINE. 1901.

Passenger Service—

Steamers.....India, China, Japan.

Ports of call... Buffalo, Detroit, Erie, Sault Ste. Marie, Mackinac Island, Hancock, Port Huron, Marquette, Duluth, Cleveland, Houghton.

Freight Service—

Steamers.....Alaska, Schuylkill, Delaware, Lycoming, Conemaugh, Codorus, Conestoga, Juniata, Mahoning, Clarion, Lehigh, Susquehanna, Wissahickon.

Ports of call... Buffalo, Detroit, Houghton, Erie, W. Superior, Sault Ste. Marie, Cleveland, Hancock, Chicago, Marquette, Duluth, Milwaukee.

CHAS. E. MARKHAN, Gen. Pass. Agt., Buffalo, N. Y.

E. T. EVANS, Western Manager, Buffalo, N. Y.

THE DONNELLY SALVAGE AND WRECKING CO., Ltd

JOHN DONNELLY, SR., Pres.
JOHN DONNELLY, JR., Vice-Pres.
H. B. FOLGER, Treas.
THOS. DONNELLY, Secy.

KINGSTON ONT.

Divers, Steam Pumps, Tugs, Etc

SUPPLIED ON SHORTEST NOTICE.

The W. L. SCOTT COMPANY, ERIE, PA.

WHOLESALE DEALER IN

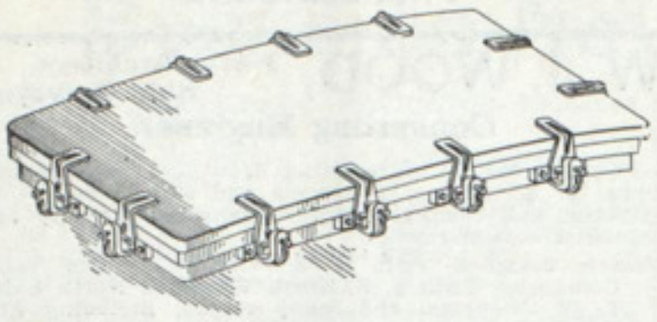
SHAMOKIN ANTHRACITE WILKESBARRE

COALS

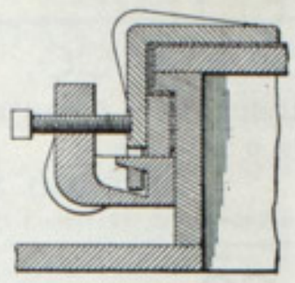
YOUGHIOGHENY PITTSBURG MANSFIELD

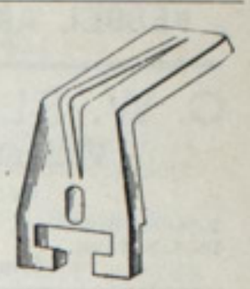
VESSEL FUELING A SPECIALTY By STEAM LIGHTER or Car Dump at all hours. Electric Light.

Main Office, Scott Block, Long Distance Telephone No. 440.
Fueling Office, Canal Dock, Long Distance Telephone No. 320.



A Successful Hatch Fastener.





Costs Less than appliances now in use.
May be applied to any vessel by an ordinary workman.

Not only holds down the hatch cover, but at the same time battens the tarpaulin so securely as to insure the cargo against damage of any kind. May be applied equally well to wood or steel vessels and made in sizes to suit any hatch. Parts are all of malleable iron ; no danger of breakage ; not affected by heat or cold.

CAPT. M. MULHOLLAND, PATENTEE,
Wade Building, CLEVELAND, OHIO.

CASTNER, CURRAN & BULLITT,

SOLE AGENTS FOR

POCAHONTAS SMOKELESS SEMI-BITUMINOUS COAL

THE BEST STEAM COAL IN THE WORLD.

Officially endorsed by Great Britain and United States. Standard Fuel of United States Navy.
Used exclusively on Cunard, White Star and other Transatlantic Lines.

Main Office, 328 Chestnut Street - - PHILADELPHIA PA.

BRANCH OFFICES:

1 Broadway, New York.
Citizens Bank Building, Norfolk, Va.
Calle Reconquista 399, Buenos Ayres, Argentine Republic, South America.
Old Colony Building, Chicago, Ills.
70 Kilby Street, Boston, Mass.
Terry Building, Roanoke, Virginia.
Neave Building, Cincinnati, Ohio.
4 Fenchurch Avenue, London, England.

PITTSBURG COAL CO.

Steamboat Fueling Facilities at various points on the Great Lakes:

Cleveland Harbor	4 Car Dumpers. 3 Lighters.	Fairport Harbor	1 Car Dumper. 1 Lighter.	Ashtabula Harbor	1 Car Dumper. 1 Lighter.	Erie Harbor	1 Car Dumper. Fuel Pockets.

Detroit River Branch	Docks and Pockets at Sandwich and Amherstburg.	Sault River Branches	Dock and Pockets at Detour. Dock and Pockets at Sault Ste. Marie. (The Port Royal Dock Co.)

WE FURNISH ONLY THE BEST GRADE OF PITTSBURG and YOUGHIOGHENY COAL.

General Office, Lake Department, Perry-Payne Building, Cleveland, O.

STEAMBOAT FUEL AT CHICAGO.

THE Y&L

Youghiogheny and Lehigh Coal Co.

J. T. CONNERY, Manager. ARCHIE J. HITCHCOCK, Dock Sup't.

FUEL DOCKS: No. 1, Michigan Slip and Basin. 'Phone 3046, Main.
No. 2, N. Halsted St. Bridge. 'Phone 773 North.
FUEL LIGHTER: Equipped with 125 2-ton Buckets for Fueling Anywhere in Harbor.

MAIN OFFICE: 1238-1242 Chicago Stock Exchange Building.
Long Distance Telephone, Main 5049. 110 LA SALLE STREET.

The Rochester & Pittsburgh Coal & Iron Co.

REYNOLDSVILLE COAL.

STEAMBOAT FUEL DOCK—Blackwell Canal at Michigan St. Bridge. 1400 feet of dock frontage. Hulett Car Dumping Machine. Steam Fuel Scow of 550 tons capacity. Boats coaled day or night.

OFFICE: 684-88 Ellicott Square, BUFFALO, N. Y.
TELEPHONE, Seneca 1154.

E. McQ. DUTHIE,
Cargo and Fuel Agent.

STANLEY B. SMITH & CO.

DETROIT, MICH.

SHIPPERS OF **COAL** BY RAIL AND LAKE

OPERATING

SMITH'S COAL DOCK, Detroit River.

VESSEL AND INSURANCE AGENTS.

C. W. ELPHICKE & CO.
Vessel and Insurance Agents,
Room 10, No. 6 Sherman St.,
C. W. ELPHICKE.
CALVIN KARR.
CHICAGO, ILL.
Long Distance Telephone, Harrison 1194.

MITCHELL & CO.
JOHN MITCHELL.
JOHN F. WEDOW.
ALFRED MITCHELL.
Vessel and Insurance Agents,
508, 509 & 510 Perry-Payne Bldg.
Office Telephone M 767.
Residence, John Mitchell, Doan 341. CLEVELAND, O.
John F. Wedow, Doan 141 J. Alfred Mitchell, Doan 218.

F. H. OSBORN & CO.
Marine Insurance Brokers,
12 Sherman Street,
Long Distance Telephone, Harrison 1586 CHICAGO.

D. T. HELM & CO.
Vessel Agents,
TRANSPORTATION. Board of Trade,
MARINE INSURANCE. DULUTH, MINN.

W. C. RICHARDSON,
Vessel and Marine Insurance Agent,
420-421 Perry-Payne Building,
Office Telephone 338.
Residence Telephone 2938. CLEVELAND, O.

D. SULLIVAN & CO.
D. SULLIVAN.
F. J. SULLIVAN
VESSEL AGENTS.
MARINE INSURANCE.
2 & 4 Sherman Street, CHICAGO, ILL.
Tel. Harrison 2847.

H. J. PAULY,
General Ship Broker,
59 Chamber of Commerce,
Telephone Main 369. MILWAUKEE, WIS.

J. G. KEITH & CO.
Vessel and Insurance Agents,
138-139 Rialto Building,
Long Distance Telephone, Harrison, 1339. CHICAGO.

HALL & ROOT,
JOHN B. HALL.
HARRY B. ROOT.
Vessel Agents,
21-22 Exchange Building, 202 Main St.,
Telephone Seneca 892. BUFFALO, N. Y.

DRAKE & MAYTHAM,
Vessel Agents,
M. M. DRAKE.
G. W. MAYTHAM.
202 Main Street,
Telephone Seneca 1660. BUFFALO, N. Y.

HUTCHINSON & CO.
Vessel and Insurance Agents,
Office Telephone, Main 2453.
Residence C. L. Hutchinson, W. 697L.
Residence W. H. McGean, E. 198J.
313-315 Perry-Payne Bldg.,
C. L. HUTCHINSON.
W. H. M'GEAN. CLEVELAND, O.

JOHN J. BOLAND,
Vessel and Insurance Agent,
25-26 Exchange Bldg., 202 Main St.,
Telephone Seneca 115. BUFFALO, N. Y

Nautical Encyclopedia
BY HOWARD PATTERSON.
Most complete work of its kind ever issued.
In press. Price $3.00. Published by the Marine Review Pub. Co., Cleveland, O.

VESSEL AND INSURANCE AGENTS.

SAMUEL HOLMES,
Steamship Offices, Morris Building,
For Selling, Chartering and Building all classes Steam Vessels. 66-68 Broad St.,
Steam Vessel Circulars.
Weekly Freight Circulars. NEW YORK.

HAWGOOD & MOORE,
Vessel and Insurance Agents,
W. A. HAWGOOD.
J. W. MOORE.
Perry-Payne Building,
Long Distance Tel. 2395. CLEVELAND, O.
Residence Phone, Doan 446—W. A. Hawgood.

THOS. WILSON, Managing Owner
WILSON'S TRANSIT LINE,
General Forwarder.
Freight and Vessel Agent. CLEVELAND, O

BROWN & CO.
J. J. H. BROWN.
J. B. RODGERS.
EDWARD SMITH.
Vessel and Insurance Agents,
202 Main Street,
BUFFALO, N. Y.

PROCTORS IN ADMIRALTY.

RAY G. MacDONALD,
Attorney at Law and Proctor in Admiralty,
Suite 618 New York Life Building,
Telephone Central 723. CHICAGO, ILL.

STOWE & GRAYDON,
Lawyers and Proctors in Admiralty.
WILLIAM E. STOWE.
THOMAS J. GRAYDON.
204 Dearborn Street,
Suite 806 Marquette Building.
Telephone Central 1225. CHICAGO.

HOYT, DUSTIN & KELLEY,
Lawyers and Proctors in Admiralty,
Offices, 702 Western Reserve Building,
CLEVELAND, O.

White, Johnson, McCaslin & Cannon,
ATTORNEYS AT LAW and PROCTORS IN ADMIRALTY,
Williamson Building, CLEVELAND, O.

GOULDER, HOLDING & MASTEN,
LAW OFFICES,
HARVEY D. GOULDER.
S. H. HOLDING.
FRANK S. MASTEN.
Perry-Payne Building,
CLEVELAND, O.

ALBERT J. GILCHRIST,
PROCTOR IN ADMIRALTY,
604 Perry-Payne Building,
CLEVELAND, O.

SAMUEL H. CROWL,
Attorney at Law and Proctor in Admiralty,
505 American Trust Building,
Phone Main 3579. CLEVELAND, O.

ORESTES C. PINNEY,
Lawyer and Proctor in Admiralty,
Rooms 316 and 317 Perry-Payne Building,
Telephone Main 2585. CLEVELAND, O.

"Elements of Navigation" (Henderson)
Just the book for beginners—mates, wheelmen and watchmen.
Recommended because it is short, simple and yet comprehensive. Price $1.
THE MARINE REVIEW PUB. CO., CLEVELAND.

PROFESSIONAL.

W. J. WOOD, Naval Architect, Ship Surveyor.
Consulting Engineer.
Prepares designs or working drawings and specifications for all classes of vessels and superintends construction and repairs. Surveys damaged property and estimates cost of repairs.
Vessels designed—Twin S. S. Virginia, Steam Yacht Comanche, Twin S. S. North West and North Land, I. W. Nicholas, and many others, including Fire Boats, Tugs, Barges, etc.
COMPLETE PLANS FURNISHED FOR STEEL COMPOSITE OR WOODEN VESSELS
Office on Goodrich Dock, foot of Michigan Avenue, CHICAGO, ILL.

Pittsburgh Testing Laboratory, Ltd.,
INSPECTING AND METALLURGICAL ENGINEERS AND CHEMISTS,
1750 Monadnock, CHICAGO. 325 Water Street, PITTSBURGH.
906-7 Crozier Building, Philadelphia.
New York City, 60 New Street.
Richmond, Va., 1107½ Main Street.
Inspectors of Shipbuilding Materials and Machinery. Inspectors located at all mills, Physical and Chemical Laboratories. Tests of all kinds.

ROBERT W. HUNT & CO.
Bureau of Inspection, Tests and Consultation.
1121 The Rookery, Chicago.
Monong. Bank Bldg., Pittsburgh.
71 Broadway, New York.
Inspectors of Shipbuilding Material and Machinery. Inspectors of all Materials. Duty Tests of Engines and Boilers. Physical and Chemical Laboratories.

HORACE SEE,
CONSULTING ENGINEER AND NAVAL ARCHITECT,
No. 1 Broadway, NEW YORK

AMBROSE V. POWELL, M. Am. Soc. C. E.
CIVIL ENGINEER,
Designs and Constructs Dry Docks, Harbor Works, Docks and Plant for Handling Coal and Ore, Foundations.
Office, 1008 Chamber of Commerce, CHICAGO, ILL.

PATENTS.

THURSTON & BATES,
Counselors at Law in Patent Causes and Solicitors of Patents,
1028 Society for Savings Bldg.,
E. L. THURSTON.
ALBERT H. BATES. CLEVELAND, O.

HERBERT WRIGHT & CO.,
1011-1015
THE WILLIAMSON BUILDING,
CLEVELAND, O.
TELEPHONE, MAIN 2754.
Every possible facility for conducting a brokerage business in
STOCKS, BONDS, GRAIN, ETC.

Compass Adjuster
CAPT. J. M. FIELDS.
Inventor of Fields' Course Finder,
BETHEL HOTEL. CLEVELAND, O.

Books on Naval Architecture, SHIP YARD PRACTICE, SEAMANSHIP, Etc.

AMERICAN PRACTICAL NAVIGATOR—Nathaniel Bowditch. $2.25.

AZIMUTH TABLES for the Great Lakes—Hydrographic Office. 50 cents.

BOILER MAKERS AND IRON SHIP BUILDERS' COMPANION. Comprising a series of original and carefully calculated tables. James Foden. $2.

BOWDITCH'S USEFUL TABLES. $1.25.

CONSTRUCTION AND MAINTENANCE OF VESSELS BUILT OF STEEL—Thos. Walton. In preparation.

DATA BOOK—Naval architects and engineer's data book. By T. H. Watson. A reliable and simple means of recording valuable data, etc., of vessels and engines. Size of book, 8¾ in. by 5 in., cloth, $2.

ELEMENTARY NAVAL TACTICS—Com. Wm. Bainbridge-Hoff, U. S. N. $2.

ELEMENTARY SEAMANSHIP—D. Wilson Barker. $2.

ELEMENTS OF NAVIGATION—Henderson. $1.

GEORGIAN BAY AND NORTH CHANNEL PILOT—Department of Marine and Fisheries, Canada.

GEORGIAN BAY AND NORTH CHANNEL SAILING DIRECTIONS—Hydrographic Office. 40 cents.

HINTS ON LEGAL DUTIES OF SHIPMASTERS—B. W. Ginsburg. $1.75.

ILLUSTRATED NAUTICAL ENCYCLOPEDIA—Howard Patterson. In press. $3.

ILLUSTRATIVE CLOUD FORMS FOR THE GUIDANCE OF OBSERVERS IN THE CLASSIFICATION OF CLOUDS—Hydrographic Office. $1.00.

INTERNATIONAL SIGNAL CODE—Bureau of Navigation. $2.50.

KNOW YOUR OWN SHIP—Thos. Walton. $2.50.

LAKE SUPERIOR AND ST. MARY'S RIVER SAILING DIRECTIONS—Hydrographic Office. 30 cents.

LATITUDE AND LONGITUDE: How to Find Them—W. J. Millar. $1.

MANUAL OF ALGEBRA—R. C. Buck. For the use, more especially, of young sailors and officers in the merchant navy; numerous examples and exercises. $1.50.

MARINER'S COMPASS IN AN IRON SHIP: How to keep it efficient and use it intelligently. J. W. Dixon. $1.

MODEL ENGINES AND SMALL BOATS—N. M. Hopkins. New methods of engine and boiler making; ship design and construction; fifty illustrations. $1.25.

MODERN PRACTICE OF SHIP BUILDING IN IRON AND STEEL. Samuel J. P. Thearle. 2 volumes. Second edition, revised and enlarged. $5.25.

NAVAL ARCHITECTURE: A treatise on laying off and building wood, iron and composite ships. Samuel J. P. Thearle. In two volumes. $3.

NAVAL ARCHITECTURE: A manual on laying off iron and steel vessels—Thos. H. Watson. Valuable for naval architects as well as beginners in ship yards. $5.

NAVAL ARCHITECTURE—Sir W. H. White. New Edition. 750 pages. $9.

NAVAL ARCHITECTURE—J. J. Welch. New edition. Out soon.

NAVAL ARCHITECTS AND SHIPBUILDER'S POCKET BOOK—Clement Mackrow. Formulae, rules and tables, and marine engineers' and surveyors' Handy Book of Reference. Seventh edition. 700 pages; pocket-book form. $5.

NAVAL POCKETBOOK—Clowe. $2. Containing valuable information concerning all navies of the world.

NAVAL SCIENCE—Sir E. J. Reed. Complete set of four volumes; half morocco. $20.

NAVIGATION AND NAUTICAL ASTRONOMY—Prof. J. H. C. Coffin. $3.50.

NAVIGATION: THEORETICAL AND PRACTICAL—D. Wilson Barker. Illustrated. $1.50.

OCEAN METEOROLOGY: For vessels of the Merchant Navy—William Allingham. $2.

THE PILOT: A guide to United States Local Inspectors' examinations of Masters and Mates. R. M. Pugsley. $1.

POCKET BOOK OF MARINE ENGINEERING, RULES AND TABLES—Seaton and Rounthwaite. For marine engineers, naval architects, superintendents and others engaged in construction of marine machinery. $3.

PRACTICAL INFORMATION ON THE DEVIATION OF THE COMPASS, for the use of Masters and Mates of Iron Ships—J. T. Towson. $2.

PRACTICAL MARINE SURVEYING—Harry Phelps. $2.50.

PRACTICAL MECHANICS, Applied to the Requirements of the Sailor—Thos. Mackenzie. $1.50.

PRACTICAL SEAMANSHIP FOR USE IN THE MERCHANT SERVICE: Including all ordinary subjects; also Steam Seamanship, Wreck Lifting, Avoiding Collision, Wire Splicing, Displacement, and everything necessary to be known by seamen of the present day. Second edition, illustrated. John Todd and W. B. Whall. $8.40.

PROJECTION TABLES—Bureau of Navigation. $1.50.

RESISTANCE AND PROPULSION OF SHIPS—Durand. $5.

RESISTANCE AND PROPULSION OF SHIPS—By Taylor. $3.75.

SAILING DIRECTIONS FOR THE GREAT LAKES AND CONNECTING WATERS. Second edition. Hydrographic Office. 30 cents.

SCOTT'S COAST PILOT FOR THE GREAT LAKES. $1.50.

SCREW PROPELLERS AND MARINE PROPULSION—I. McKim Chase. $2.50.

SELF-INSTRUCTION IN THE PRACTICE AND THEORY OF NAVIGATION—Earl of Dunraven. Two volumes. $7.

SHIP BUILDING—Tables for constructing ship's lines. Second edition. Archibald Hogg. $2.

SIMPLE ELEMENTS OF NAVIGATION—Young. New second edition, $2; a few copies of the first edition at $1.

STABILITY OF SHIPS—Sir E. J. Reed. $8.40.

STEAM YACHTS AND LAUNCHES—By Kuhnhardt. $3.

STEERING OF SHIPS AND YACHTS AND MANEUVERING THEM IN NARROW WATERS; having especial reference to the influence of the Screw Propeller on the steering of steamers. Sir C. Purcell Taylor. $1.25.

ST. LAWRENCE RIVER SAILING DIRECTIONS. Second edition. Hydrographic Office. 70 cents.

SUBMARINE BOATS—By Hovguard. $2.

TABLES FOR FINDING THE DISTANCE OF AN OBJECT BY TWO BEARINGS—Hydrographic Office, U. S. N. 30 cents.

TEXT BOOK OF SEAMANSHIP—Com. S. B. Luce, U. S. N. Equipping and handling of vessels under sail or steam. $10.

THEORETICAL NAVAL ARCHITECTURE: A treatise on the calculations involved in naval design. Samuel J. P. Thearle. In two volumes. $3.50.

THEORETICAL NAVAL ARCHITECTURE—E. L. Attwood. Text book; 114 diagrams. $2.50.

TRIGONOMETRY FOR THE YOUNG SAILOR—R. C. Buck. $1.50.

"WRINKLES" IN PRACTICAL NAVIGATION. Ninth edition, revised. S. T. S. Lecky. $8.40.

Books on Marine Engineering, On the Operation of Engines and for Beginners in the Engine Room.

AIDS TO ENGINEERS' EXAMINATIONS, with Questions and Answers—N. Hawkins. $2.

ALGEBRA SELF-TAUGHT—W. P. Higgs. Fourth edition. 60 cents.

AMERICAN MARINE ENGINEER—By Edwards. $2.50.

ARITHMETIC OF THE STEAM ENGINE—E. S. Gould. $1.

BREAKDOWNS AT SEA AND HOW TO REPAIR THEM—A. R. Leask. 252 pages. $2.

BREAKDOWNS—Thos. Reed. $1.50.

CATECHISM OF THE MARINE STEAM ENGINE—Edwards. $2.

DATA BOOK—Valve setting record book, for the use of marine engineers, by P. A. Low. 60 cents.

DATA BOOK—The engineer's and draughtsman's data book, for workshop and office use. So arranged that the data of a complete set of engines, boilers, auxiliary engines, pumps, etc., for a steamship can be recorded on four pages. Enough space for 20 sets of engines. Bound in full limp leather. $1.25.

DATA BOOK—Marine engineer's record book—engines. By Bryan C. Bartley. Names of all parts, etc., are printed in one column on the left hand side of book when opened, and the remaining space is lined and column ruled for the recording of all necessary data. Complete thumb index which will facilitate ready reference. Contains enough space for 22 complete sets of engines. Size of book, 7¾x5¼ in., bound in full limp leather. $2.00.

DRAWING AND DESIGNING FOR MARINE ENGINEERS—Chas. W. Roberts. $3.

ELECTRIC LIGHTING FOR MARINE ENGINEERS, or how to light a ship by the electric light and how to keep the apparatus in order. S. F. Walker. $2.

ELECTRIC SHIP LIGHTING—A hand book on the practical fitting and running of ship's electrical plant. J. W. Urquhart. $3.

ELEMENTARY LESSONS IN STEAM MACHINERY—Langmaid and Galsford. For students and subordinates in marine engineering. $2.

ENGINEER'S MANUAL—By Ainsley. $5.

ENGINE ROOM PRACTICE—John Leveridge. $2.50.

ENGINES AND ENGINE RUNNING—Joshua Rose. For the use of those who desire to pass an examination to take charge of an engine or boiler; illustrated. $2.50.

EXAMINATION QUESTIONS AND ANSWERS—Emory Edwards. 900 examination questions and answers for young engineers and firemen who desire to obtain marine licenses. $1.50.

GAS AND OIL ENGINES—G. Richmond. A practical hand book on the care and management of gas engines, with instructions for running oil engines. $1.

HAND BOOK OF ENGINEERING PRACTICE—Richard A. Smart. $1.25.

HAWKINS' INDICATOR CATECHISM. $1.

HIGH SPEED STEAM ENGINES—W. Norris and Ben H. Morgan—With 115 Illustrations. $2.50.

HOW TO RUN ENGINES AND BOILERS. Practical instruction for young engineers and steam users. E. P. Watson. $1.

KEY TO ENGINEERING, WHAT AN ENGINEER SHOULD KNOW ABOUT ELECTRICITY and ENGINEER'S EPITOME—Three excellent little books for marine engineers. 50 cents each, or three for $1.

KEY TO ENGINES AND ENGINE RUNNING—Joshua Rose. For use of those desiring to pass examination to take charge of an engine or boiler. $2.50.

LESSONS AND PRACTICAL NOTES ON STEAM, THE STEAM ENGINE, PROPELLERS, ETC.—King. $2.

LIBRARY OF STEAM ENGINEERING—John Fehrenbatch, M. E. $5.

MACHINISTS' AND DRAFTMEN'S HAND BOOK—Peder Lobben. A reference book for all interested in mechanical work. $2.50.

MARINE BOILER MANAGEMENT AND CONSTRUCTION—C. E. Stromeyer. $5.

MARINE BOILERS: A treatise on the Causes and Prevention of their Priming, with remarks on their general management. Reed. $2.

MARINE BOILERS—L. E. Bertin. 250 illustrations, designs and tables. $7.50.

MARINE BOILERS—Triplex. $1.

MARINE ENGINEERS—Constantine. Just out. $2.50.

MARINE ENGINES AND STEAM VESSELS—By Murray. $1.60.

MARINE ENGINES—R. Murray. $1.80.

MARINE PROPELLERS—By Barnaby. $4.25.

MARINE STEAM ENGINES—Sennett & Oram. $6.

MARINE STEAM ENGINES—Main and Brown. $5.

MECHANICS' AND ENGINEERS' POCKET BOOK, including Naval Architecture, Steam and the Steam Engine, Steam Vessels, etc. 64th edition, 1050 pages. Chas. H. Haswell. $4.

MECHANICAL ENGINEERS' POCKET BOOK—Wm. Kent. Reference book of rules, tables, etc. $5.

MECHANISM OF MEN-OF-WAR—R. C. Oldknow. A description of machinery to be found in modern fighting ships. Numerous illustrations. $3.

MODERN EXAMINATIONS OF STEAM ENGINEERS—W. H. Wakeman. $1.50.

MODERN AMERICAN MARINE ENGINES—By Edwards. $5.

MODERN MARINE ENGINEERING—By Burgh. $10.

NAUTICAL ENCYCLOPEDIA, ILLUSTRATED—Howard Patterson. Complete from Standpoint of Marine Engineer and Naval Architect. In press. $3.

NAVAL ENGINEER AND THE COMMAND OF THE SEA—F. G. Burton. $1.25.

NEW CATECHISM OF ELECTRICITY—N. Hawkins. $2.

POCKET BOOK OF MARINE ENGINEERING, RULES AND TABLES—Seaton and Rounthwaite. For marine engineers, naval architects, superintendents and others engaged in construction of marine machinery. $3.

PRACTICAL ADVICE FOR MARINE ENGINEERS—C. W. Roberts. 64 illustrations. $1.

PROGRESS OF MARINE ENGINEERING—By Main. $1.50.

QUESTIONS AND ANSWERS, 188 Elementary, from Reed's Engineers' Hand Book. A valuable help to the young engineer working up for his license. $1.

QUESTIONS AND ANSWERS, sixth edition—Stephen Roper. $2.

REED'S ENGINEERS' HAND BOOK—New edition; illustrated by 345 diagrams and 36 large plates. $5.
REED'S GUIDE. $5.

REED'S KEY to Reed's Hand Book—Contains working of all questions given in examination papers. $3.

RESISTANCE AND PROPULSION OF SHIPS—W. F. Durand, principal of school of marine construction, Cornell University. $5.

ROPER'S ENGINEERS' HANDY BOOK for Steam Engineers and Electricians. Revised and enlarged. $3.50.

SCREW PROPULSION—By Taylor. $3.75.

SLIDE VALVE, SIMPLY EXPLAINED—W. J. Tennant. $1.

SLIDE VALVES—C. W. MacCord, Jr. A book for practical men on the principles and methods of design. $1.50.

SMALL ENGINES AND BOILERS—Egbert P. Watson. A manual of concise and specific directions for construction of small steam engines and boilers of modern types; illustrated. $1.25.

STEAM AND THE MARINE STEAM ENGINE—Jno. Yeo. $2.50.

STEAM BOILERS: Their management and working on land and sea. James Peattie. $2.

STEAM BOILERS—Joshua Rose. Practical treatise on construction and examination. Seventy-three engravings. $2.50.

STEAM BOILERS—Peabody & Miller. $2.50.

STEAM ENGINES AND BOILERS—Frederick Colyer. $5.

STEAMSHIPS AND THEIR MACHINERY—By Haldane. $6.

TEXT BOOK ON MARINE ENGINEERING—Tompkins. $3.00.

THEORETICAL AND PRACTICAL AMMONIA REFRIGERATION—I. I. Redwood. $1.

THEORY OF STEAM ENGINE—Weisbach. $5.

TRIPLE AND QUADRUPLE EXPANSION ENGINES AND BOILERS AND THEIR MANAGEMENT—A. Ritchie Leask. Third edition, revised. $2.

USEFUL HINTS TO SEAGOING ENGINEERS, AND HOW TO REPAIR AND AVOID BREAKDOWNS. Second edition, revised and enlarged. Reed. $1.40.

WATER TUBE BOILERS—Fourth revised and enlarged edition of HOW TO RUN ENGINES AND BOILERS—E. P. Watson. Practical instruction for young engineers and steam users. $1.

The Marine Review Publishing Co.,

Sent to any address, carriage prepaid, at prices named. **PERRY-PAYNE BUILDING, CLEVELAND.**

BUYERS' DIRECTORY OF THE MARINE TRADE.

For a more complete classification than that represented by advertisers in the Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, marine and naval directory of the United States, published by the Marine Review Pub. Co., 418-419 Perry-Payne Bldg., Cleveland.

See accompanying Index of Advertisers for full addresses of concerns in this directory.

AIR COMPRESSORS, AIR HOISTS, ETC.

"Long Arm" System Co.....Cleveland.

ANCHORS.

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.
Seaboard Steel Casting Co.....Chester, Pa.

ANTI-FRICTION METALS.

Cramp, Wm. & Sons.....Philadelphia.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.

American Blower Co.....Detroit.
American Ship Building Co.....Cleveland.
Bloomsburg & Co., H.....Newport News, Va.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

ATTORNEYS AND PROCTORS IN ADMIRALTY.

Crowl, Samuel H.....Cleveland.
Gilchrist, Albert J.....Cleveland.
Goulder, Holding & Masten.....Cleveland.
Hoyt, Dustin & Kelley.....Cleveland.
MacDonald, Ray G.....Chicago.
Pinney, Orestes C.....Cleveland.
Stowe & Graydon.....Chicago.
White, Johnson, McCaslin & Cannon.....Cleveland.

BAROMETERS, MARINE GLASSES, ETC.

Bliss, John & Co.....New York.
Goerz, C. P.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

BENDING AND STRAIGHTENING ROLLS.

Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

BLOCKS, SHEAVES, ETC.

Boston & Lockport Block Co.....Boston, Mass.
Cleveland Block Co.....Cleveland.
Coleman & Sons, Walter.....Providence, R. I.

BLOWERS.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

BOAT NAILS AND SPIKES.

American Steel & Wire Co.....Chicago.

BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Kahnweiler's Sons, David.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

BOILER MANUFACTURERS.

Almy Water Tube Boiler Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Babcock & Wilcox Co.....New York.
Bath Iron Works, Ltd.....Bath, Me.
Boyer Water Tube Boiler Co.....New York.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
Dearing Water Tube Boiler Co.....Detroit.
Delaunay, Belleville & Co.....St. Denis, France.
Detroit Screw Works.....Detroit.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Ship & Engine Co.....Weymouth, Mass.
Gas Engine & Power Co.....Morris Heights, N. Y.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Kingsford Foundry & Machine Works....Oswego, N. Y.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Building Co.Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roberts Safety Water Tube Boiler Co.....New York.
Stirling, The Co.....Chicago.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

BOILER RIVETS.

Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BOLT CUTTERS.

Niles Tool Works Co.....Hamilton, O.

BORING AND TURNING MILLS.

Niles Tool Works Co.....Hamilton, O.

BRASS AND BRONZE CASTINGS.

Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Phosphor Bronze Smelting Co.....Philadelphia.

BRIDGES, BUILDERS OF.

American Bridge Co.....New York.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Machine Co.....Cleveland.
McMyler Mnfg. Co.....Cleveland.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

CHAINS.

Monongahela Iron & Steel Co.....Pittsburg.
Newhall Chain Forge & Iron Co.....New York.
Standard Chain Co.....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

CHUCKING MACHINES.

Niles Tool Works Co.....Hamilton, O.

CHUCKS FOR LATHES, DRILLS AND PLANERS.

Skinner Chuck Co.....New Britain, Conn.

CIRCULATOR, EQUILIBRIUM, with Steam Heating Attachment.

Bloomsburg & Co., H.....Newport News, Va.

CLOCKS (Marine), CHRONOMETERS, BELLS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Ohio Fuel Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
Scott Co., The W. L.....Erie, Pa.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting Machinery Co., Incorporated .Cleveland.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Fields, J. M.....Cleveland.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CORRESPONDENCE SCHOOLS—ENGINEERING AND NAVIGATION.

Chicago Nautical School.....Chicago.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting Machinery Co., Incorporated .Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

CRANK PINS.

Cleveland City Forge & Iron Co.....Cleveland.

DIVING APPARATUS.

Hale Rubber Co., Alfred.....So. Boston, Mass.

DOORS—PNEUMATIC AND ELECTRIC SAFETY POWER DOORS AND HATCHES.

"Long Arm" System Co.....Cleveland.

DRILL PRESSES—DRILLS OF ALL KINDS.

Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

DRYING APPARATUS.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Sturtevant, B. F. Co.....Boston

DRILLS, PNEUMATIC.

Standard Pneumatic Tool Co.....Chicago.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co.....New York.
Union Iron Works.....San Francisco.

ELECTRIC AUTOMATIC WHISTLE OPERATORS.

Signal & Control Co.....New York.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
Bullock Electric Mnfg. Co.....Cincinnati.
Electro-Dynamic Co.....Philadelphia.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Seidler-Miner Electric Co.....Detroit.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC HOISTS AND CRANES.

Bullock Electric Mnfg. Co.....Cincinnati.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Ship & Engine Co.....Weymouth, Mass.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lake Shore Engine Works.....Marquette, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Olds Motor Works.....Detroit.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.
Seidler-Miner Electric Co.....Detroit.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane & Co.....Chicago.
Reilly Repair & Supply Co., James.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co.....Philadelphia.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Wood, W. J.....Chicago.

EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James.....New York.

FANS FOR VENTILATION, EXHAUST, ETC.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James.....New York.
Reynolds, H. J.....Cleveland.
Warren Webster & Co.....Camden, N. J.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FORGINGS.

Bourne-Fuller Co.....Cleveland.
Cleveland City Forge & Iron Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas)....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Ohio Fuel Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
Scott Co., The W. L.....Erie, Pa.
Smith, Stanley B. & Co.....Detroit.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Lake Shore Engine Works.....Marquette, Mich.
McMyler Mnfg. Co.....Cleveland.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HATCH FASTENERS.
Mulholland, M.....Cleveland.

HATCH GEARS.
"Long Arm" System Co.....Cleveland.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., Incorporated. Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

HOSE FOR PNEUMATIC TOOLS.
Sayen & Schultz.....Philadelphia.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

IGNITERS FOR GAS ENGINES.
Holtzer-Cabot Electric Co.....Brookline, Mass.

INJECTORS.
Crane Co.....Chicago.
Jenkins Bros.....New York.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn, F. H. & Co.....Chicago.
Pauly, H. J.....Milwaukee.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

LAUNCHES—NAPHTHA, ELECTRIC.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

LOGS.
Walker & Son, Thomas.....Birmingham, Eng.
Also Ship Chandlers.

MACHINE TOOLS.
Niles Tool Works Co.....Hamilton, O.

MACHINE TOOLS (WOOD WORKING).
Fay & Egan Co., J. A.....Cincinnati, O.
Atlantic Works, Inc.....Philadelphia.

MALLETS FOR CAULKERS, BOILER MAKERS, ETC.
N. Y. Mallet & Handle Works.....New York.

MARINE RAILWAYS, BUILDERS OF
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Blower Co.....Detroit.
American Ship Building Co.....Cleveland.
Boston Blower Co.....Hyde Park, Mass.
Bloomsburg & Co., H.....Newport News, Va.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.
American Steam Packing Co.....Boston.
Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.
Paul & Co., J. C.....Chicago.

MILLING MACHINES OF ALL KINDS.
Niles Tools Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.
See, Horace.....New York.
Wood, W. J.....Chicago.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

OUTFITTING OF VESSELS—CARPETS, FURNITURE, ETC.
Sterling, Welch & Co.....Cleveland.
Williams & Rodgers Co.....Cleveland.

PACKING.
American Steam Packing Co.....Boston, Mass.
Crane Co.....Chicago.
Garlock Packing Co.....Palmyra, N. Y.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Sayen & Schultz...ffl.....Philadelphia.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Atlantic Works, Inc.....Philadelphia.

PIPE THREADING AND CUTTING MACHINES.
Merrell Mnfg. Co.....Toledo, O.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.

PLANERS OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Atlantic Works, Inc.....Philadelphia.

PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Reilly Repair & Supply Co., James.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.
Paul & Co., J. C.....Chicago.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Ship & Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath, Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.

PROJECTORS, ELECTRIC.
Bullock Electric Mnfg. Co.....Cincinnati.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Kingsford Foundry & Machine Works....Oswego, N. Y.
Wood, R. D. & Co.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood, R. D. & Co.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER GOODS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.
Roebling's Sons, John A.....New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCHOOLS, CORRESPONDENCE—ENGINEERING AND NAVIGATION.
Chicago Nautical School.....Chicago.

SEAM COMPOSITION AND ELASTIC SEAM PAINT.
Cole & Kuhls.....Brooklyn.

SEARCH LIGHTS.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

SHAPERS.
Niles Tool Works Co.....Hamilton, O.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Ship & Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.
American Bridge Co.....New York.

SUBMARINE DIVING APPARATUS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

SURVEYORS, MARINE.
See, Horace.....New York.
Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Standard Pneumatic Tool Co.....Chicago.
Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.
Fay & Egan Co., J. A.....Cincinnati, O.
Atlantic Works, Inc.....Philadelphia.

TRAPS, STEAM.
Haines Co., Wm. S.....Philadelphia.

TRUCKS.
Boston & Lockport Block Co.....Boston.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

TUBING, SEAMLESS.
Benedict & Burnham Mnfg. Co.....Waterbury, Conn.
Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co.....Chicago.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.
Smith, Edward & Co.....New York.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.

VENTILATING APPARATUS FOR SHIPS.
American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Fay & Egan Co., J. A.....Cincinnati, O.
Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

Almy Water Tube Boiler Co..... 11
American Blower Co..... 40
*American Bridge Co..... 26
American Line..... 7
American Ship Building Co..... 1
American Ship Windlass Co..... 2
American Steam Gauge Co..... 1
American Steam Packing Co..... 31
American Steel & Wire Co..... 1
Armstrong Cork Co..... 40
Ashton Valve Co..... 12
Atlantic Works..... 5
*Atlantic Works, Inc..... 6

Babcock & Wilcox Co..... 11
Baldt Anchor Co..... 9
Baker, Howard H. & Co..... 9
Bath Iron Works, Ltd..... 1
Benedict & Burnham Mnfg. Co..... 28
Bertram's Oil Polish Co..... 1
Bessemer Steamship Co..... 8
Big Four Railway..... 39
Blake, Geo. F., Mnfg. Co..... 9
*Bliss, John & Co..... 30
*Bloomsburg & Co., H..... 31
Boland, J. J..... 34
Boston Blower Co..... 4
*Boston & Lockport Block Co..... 40
*Boyer Water Tube Boiler Co..... 31
Bourne-Fuller Co..... 12
Brown & Co..... 34
Brown Hoisting Machinery Co., Inc..... 2
Buffalo Dry Dock Co..... 11
Buffalo Forge Co..... 12
Bullock Electric Mnfg. Co..... 1

Castner, Curran & Bullitt..... 33
Champion Rivet Co..... 8
Chase Machine Co..... 6
Chicago Nautical School..... 6
Chicago Ship Building Co..... 2
Cleveland City Forge & Iron Co..... 6
Cleveland Punch & Shear Works Co..... 12
C. C. C. & St. L. R. R..... 39
Cole & Kuhls..... 9
Coleman & Sons, Walter..... 40
Continental Iron Works..... 2
Cory, Chas. & Son..... 10
*Craig Ship Building Co..... 30
Cramp, Wm., & Sons, S. & E. B. Co..... 1
Crandall & Son, H. I..... 7
Crane Co..... 6
Crosby Steam Gage & Valve Co..... 12
Crowl, Samuel H..... 34

Dearborn Drug & Chemical Works..... 30
Dearing Water Tube Boiler Co..... 29
Delauney, Belleville & Co..... 27
Delaware River Iron S. B. & E. Works. 5
Detroit Shipbuilding Co..... 1
Detroit Screw Works..... 11
Dixon Crucible Co., Joseph..... 9
Donnelly Salvage & Wrecking Co..... 32
Drake & Maytham..... 34
Drein, Thos. & Son..... 4
Duluth, South Shore & Atlantic Ry..... 39

Electro-Dynamic Co..... 1
Ellis Marine Plumbing Co..... 7
Elphicke, C. W. & Co..... 34
Elwell-Parker Electric Co..... 2
Erie & Western Trans. Co..... 32

Falls Hollow Staybolt Co..... 4
Farrar & Trefts..... 5
Fay & Egan Co., J. A..... 7
Fields, J. M..... 34
Fletcher, W. & A. Co..... 4
Fore River Ship & Engine Co..... 5
Fogg, M. W..... 31

Garlock Packing Co..... 28
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated..... 31
General Electric Co..... 12
Gilchrist, Albert J..... 34
Goerz, G. P..... 9
Goulder, Holding & Masten..... 34
Great Lakes Register..... 7

Haines Co., Wm. S..... ..
Hale Rubber Co., Alfred..... 9
Hall & Root..... 34
Hanna, M. A. & Co..... 32
Hardy, John B..... 4
Harlan & Hollingsworth Co., The..... 5
Hawgood & Moore..... 34
Helios-Upton Co..... 8
Helm, D. T. & Co..... 34
Herriman, F. D..... 7
Hodge, S. F. & Co..... 8
Holmes, Samuel..... 34
Holtzer-Cabot Electric Co..... 2
Hoyt, Dustin & Kelley..... 34
Hunt, Robert W. & Co..... 34
Hutchinson & Co..... 34
Hyde Windlass Co..... 40

International Anchor Co..... 9
International Navigation Co..... 7

Jenkins Brothers.....10-12
Jenks Ship Building Co..... 39

Kahnweiler's Sons, David..... 4
Katzenstein, L. & Co..... 4
Keith, J. G. & Co..... 34
Kingsford Foundry & Machine Works.. 30

Lake Shore Engine Works..... 1
Lane & DeGroot..... 4
*Learmonth, Robert..... 30
Lidgerwood Mfg. Co..... 10
Lockwood Mnfg. Co..... 4
"Long Arm" System Co..... 3
L. S. & M. S. Ry..... 39

McMyler Mfg. Co..... 8
MacDonald, Ray G..... 34
MacKinnon Mfg. Co..... 8
Mair, John & Son..... 6
*Marine Iron Co..... 7
Martin-Barriss Co..... 8
Maryland Steel Co..... 5
Merrell Mnfg. Co..... 5
Midland Towing & Wrecking Co., Ltd.. 40
Miller, Walter..... 9
Mitchell & Co..... 34
Monongahela Iron & Steel Co..... 3
*Moran Bros. Co..... 39
*Mott Iron Works, J. L..... 10
Mulholland, M..... 33

Neafie & Levy Co..... 5
*Newhall Chain Forge & Iron Co..... 30
Newport News Ship Building & Dry Dock Co..... 5
New York Mallet & Handle Works..... 30
Niles Tool Works Co..... 3
Nixon, Lewis..... 5
North River Iron Works..... 4

*Ohio Fuel Co..... 39
Olda Motor Works..... ..
Osborne & Co., F. H..... 34

Page Bros. & Co..... 3
Parker, A. A. & B. W..... 32
Paul & Co., J. C..... 28
Pauly, H. J..... 34
Peck, Chas. E. & W. F..... 7
Phosphor Bronze Smelting Co., Ltd..... 8
Pickands, Mather & Co..... 32
Pinney, Orestes C..... 34
Pittsburg Coal Co..... 33
Pittsburgh Testing Laboratory, Ltd..... 34
Porter's Sons' Co., Wm..... 4
Powell, Ambrose V..... 34
Pusey & Jones Co..... 5

Queen City Engineering Co..... 10

Red Star Line..... 7
*Reilly Repair & Supply Co., James..... 10
Reynolds, H. J..... 9
Richardson, W. C..... 34
Risdon Iron Works..... 5
*Ritchie & Sons, E. S..... 30
Roach's Ship Yard..... 5
Roberts Water Tube Boiler Co..... 11
Rochester & Pittsburgh Coal & Iron Co. 33
*Roebling's, John A. Sons Co..... 40
Rushmore Dynamo Works..... 4

Safety Car Heating & Lighting Co..... 31
Sands, Alfred B. & Son..... 10
Sayen & Schultz..... 1
Scherzer Rolling Lift Bridge Co..... 6
Scott Co., The W. L..... 32
Seaboard Steel Casting Co..... 28
See, Horace..... 34
Seidler-Miner Electric Co..... 8
Sheriffs Mfg. Co..... 10
*Signal & Control Co..... 7
Skinner Chuck Co..... 3
Smith, Edward & Co..... 1
Smith, Stanley B. & Co..... 33
Stratford Oakum Co., Geo..... 32
Standard Chain Co..... 10
*Standard Oil Co..... 31
Standard Releasing Hook Co..... 2
*Standard Pneumatic Tool Co..... 26
Standard Seamless Tube Co..... 29
Sterling, Welch & Co..... 32
Stirling Co..... 11
Stowe & Graydon..... 34
Sturtevant, B. F. Co..... 40
Sullivan & Co..... 34
Swain Wrecking Co..... 33

Thurston & Bates..... 34
Townsend & Downey Ship Bldg. Co..... 4
Trigg Co., Wm. R..... 4
Trout, H. G..... 9

Union Iron Works..... 5
Upson-Walton Co..... 40
U. S. Metallic Packing Co..... 40

Walker, Thomas & Son..... 3
Warren Webster & Co..... 10
Westinghouse Electric & Mnfg. Co..... 6
Wheeling & Lake Erie R. R..... 39
White, Johnson, McCaslin & Cannon..... 34
Willard, Chas. P. & Co..... 30
Williams & Rodgers Co..... 32
Wilson, Thomas..... 34
Wilson & Silsby..... 6
Wood, W. J..... 34
*Wood & Co., R. D..... 30
Worthington, Henry R..... 9
Wright, Herbert & Co..... 34

Youghiogheny & Lehigh Coal Co..... 33

MORAN BROS. COMPANY

SEATTLE, WASHINGTON

SHIP AND ENGINE BUILDERS

STEEL AND WOOD VESSELS, STEAM OR SAIL

FOR OCEAN, SOUND AND RIVER SERVICE

FOUNDRY, MACHINE, BOILER AND FORGE SHOPS

LARGEST TOOLS AND EQUAL TO ANY REQUIREMENT

HEAVY FORGINGS A SPECIALTY

DRY DOCK AND MARINE RAILWAY

Two-Section balanced floating dry dock, 400 ft. long, 60 ft. between towers; patent steel wedge keel blocks; 12,000 tons displacement.

CAPACITY OF MARINE RAILWAY 1500 TONS

SHIP CHANDLERY, ENGINEERS' SUPPLIES

SAW AND PLANING MILL

CAPACITY: TIMBER, 48 INCHES SQUARE, 125 FEET LONG

Including every description of ROUGH, DRESSED or KILN DRIED

YELLOW FIR, RED CEDAR OR SPRUCE

We make a specialty of long and large timber and can DRESS FOUR SIDES 20 x 30 INCHES.

SPARS — THE LONGEST, LARGEST, CLEAREST AND BEST IN THE WORLD; ROUGH OR HEWN.

PILES — OR TIMBER OF ANY DESCRIPTION.

CARS FROM ALL TRANSCONTINENTAL ROADS

ENTER OUR YARDS AND DOCKS

DOCK SHIPMENTS TO ALL PARTS OF THE WORLD

ELECTRIC CRANE — Capacity to transfer 75 tons from car to vessel

WE INVITE CORRESPONDENCE

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY.

CLEVELAND CITY TICKET OFFICE 237 SUPERIOR ST.

Eastward:—	Ar. fr. West.	Dep. East.
No. 18, Southwestern Limited	.....	*1 55 am
No. 22, Lake Shore Limited	*2 15 am	*2 20 am
No. 28, New York & Boston Express	*7 40 am	*8 00 am
No. 32, Fast Mail	*11 25 am	*11 30 am
No. 44, Accommodation, via Sandusky	†1 25 pm	.....
No. 46, Southwestern Express	.....	*2 00 pm
No. 6, Limited Fast Mail	*5 40 pm	*5 45 pm
No. 10, Chicago, New York & Boston Special	*7 35 pm	*7 40 pm
No. 16, New England Express	*10 30 pm	*10 35 pm
No. 2, Day Express	†9 05 pm	†9 20 pm
No. 26, Night Express	*7 30 am	.....
No. 126, Norwalk Accommodation	†8 40 am	.....
No. 40, Toledo & Buffalo Accom., via Norwalk.	†10 00 am	†10 30 am
No. 126, Norwalk Accommodation	†7 55 am	.....
No. 116, Conneaut Accommodation	.....	†4 30 pm
Westward:—	**Ar. fr. East.**	**Dep. West.**
No. 11, Southwestern Limited	*3 25 am	.....
No. 15, New York, Boston & Chicago Special	*3 05 am	*3 10 am
No. 21, New York & Chicago Express	*5 10 am	*5 20 am
No. 7, Day Express	.....	†8 30 am
No. 19, The Lake Shore Limited	*7 35 am	*7 40 am
No. 23, Western Express	*11 10 am	*11 15 am
No. 33, Southwestern Express	*12 25 pm	.....
No. 133, Cleveland & Detroit Express	.....	*12 30 pm
No. 47, Accommodation	.....	†3 00 pm
No. 141, Sandusky Accommodation	.....	†3 10 pm
No. 127, Norwalk Accommodation	.....	†5 10 pm
No. 37, Pacific Express	*6 35 pm	*7 00 pm
No. 3, Fast Mail Limited	*10 50 pm	*10 55 pm
No. 115, Conneaut Accommodation	8 20 am	.....

*Daily. †Daily except Sunday. Trains Nos. 28 and 37 run via Erie station.

ONE CENT per mile to BELLEFONTAINE, O., AND RETURN

VIA "BIG FOUR ROUTE."

ON ACCOUNT OF

Grand Army of the Republic Annual State Encampment,

MAY 7th to 9th, 1901.

Round trip tickets to Bellefontaine will be on sale on May 6th, 7th and 8th, from all "Big Four" points in Ohio at one cent per mile rates (except no rate less than 25 cents.) Tickets good for return until May 10th, 1901. For full information and particulars as to rates, tickets, limits, etc., call on Agents "Big Four" Route, or address the undersigned.

WARREN J. LYNCH, Genl. Pass. & Tkt. Agt. CINCINNATI, O.

W. P. DEPPE, A. G. P. & T. Agt. CINCINNATI, O.

D. JAY COLLYER, C. P. & T. A. 116 Euclid Ave. CLEVELAND.

WANTED, FOR SALE FOR CHARTER, Etc.

Space under this heading 25 cents a line, each insertion, for three insertions or less. Special rates for periods of more than three insertions.

—ENGINEERS' LICENSE—Mechanics, Engineers, Firemen, Electricians, etc., 40-page pamphlet containing Questions asked by Examining Board of Engineers. Sent free. Geo. A. Zeller, Publisher, Room 355, 18 S. 4th Street, St. Louis, Mo. May 30.

--FOR SALE—Sutton marine engine, 12x14 in. In good condition. This includes propeller, shaft, stuffing box, outboard and inboard bearings, heater, shoe and steering wheel. Outfit complete $250. One circle saw, for sawing ship timber, $100. H. M. Louds Sons Co., Au Sable, Mich. May 2.

—FOR SALE—A first-class lumber schooner, capacity 275,000. Cheap for cash. Address Wm. E. Barrett & Co., Grand Rapids, Mich. May 9.

—WANTED—Agents to call on all consumers of polishes, particularly yachts, steamers, etc. Bertram's Oil Polish Co., Boston, Mass. tf

—FOR SALE—Side-wheel tug, 66 ft. long, 5 ft. depth. Boilers new. Machinery in good state of repair. The I. Stephenson Co., Wells, Mich. (Delta county). April 25.

—FOR SALE OR CHARTER—British steamer of Welland canal dimensions; about 3,250 gross tons capacity, carrying about 2,000 gross tons on 14 ft. (fresh water) draught. Speed 10 knots loaded; easy consumption. Large hatchways. Address "Charter," The Marine Review Pub. Co., Cleveland. May 2.

—FOR SALE—Complete plant for steel ship building. P. O. Box 23, Perth Amboy, N. J.

—FOR SALE—Harbor tugs Owen and Delta. Engines 20x20 and 20 x22 in., respectively. Good boats. Cheap for cash. Ranney Bros., 65 Merwin St., Cleveland. tf.

—FOR SALE—Five electric passenger launches 35 ft. over all and will seat twenty-eight. Milwaukee Electric Launch Co., 1504 Monadnock Block, Chicago. tf

THE Marquette ROUTE

DULUTH, SOUTH SHORE AND ATLANTIC RAILWAY.

The Only Line Reaching MARQUETTE, MICH.

"The Queen of Northern Summer Resorts."

Hotel Accommodations thoroughly first-class, headed by the Hotel Superior, the finest Hostelry on the Great Lakes.

GEO. B. ROSS, Lessee, HOTEL SUPERIOR, MARQUETTE, MICH.; Proprietor LEXINGTON HOTEL, CHICAGO, ILL.; formerly Manager CHICACO BEACH HOTEL.

——WRITE THE UNDERSIGNED FOR ILLUSTRATED PUBLICATIONS.——

E. C. OVIATT, Trav. Pass. Agent, 76 Ottawa St., GRAND RAPIDS, MICH.

G. A. CLIFFORD, Trav. Pass. Agent, CINCINNATI, OHIO.

A. E EDMONDS, City Pass. Agent, DETROIT, MICH.

F. W. SALSBURY, Commercial Agent, PITTSBURG, PA.

J. F. LEE, Gen'l Agt. Pass. Dept., 228 So. Clark St., CHICAGO, ILL.

GEO. W. HIBBARD, Gen'l Pass. Agent, MARQUETTE, MICH.

W. S. JENKS, President.

O. L. JENKS, Vice-Pres. and Treas.

A. M. CARPENTER, Sec. and Gen'l Mgr.

The Jenks Ship Building Co.

Office and Machine Shops at Fourth St. Yards: Foot of Lincoln Ave.

PORT HURON, MICH.

Steel and Wood Ship Builders.
Marine Engines and Boilers.

STEAM WINDLASSES,
CAPSTANS AND
STEERING APPARATUS.

PROMPT ATTENTION GIVEN TO REPAIRS OF ALL KINDS ON SHIPS, ENGINES AND BOILERS.

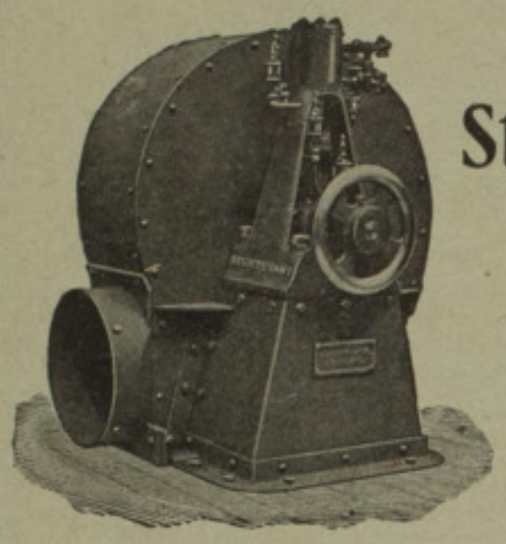
OPERATES THE ONLY THROUGH BUFFET PARLOR CAR LINE Between Cleveland, Canton and Wheeling.

Wheeling AND Lake Erie R. R.

J. N. MERWIN, G. P. A. E. B. COOLIDGE, G. P. A. CLEVELAND, O.

Forced Draft Fans

—FOR—



Steam Yachts.

Increases Boiler apacity.

Decreases Dead Weight.

SEND FOR CATALOGUE No. 96.

B. F. Sturtevant Co.

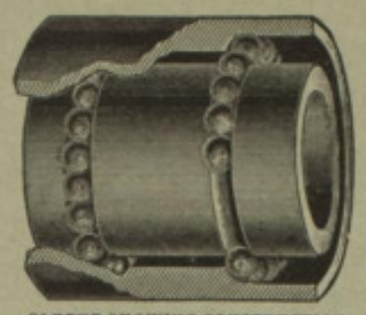
BOSTON, MASS.

NEW YORK. PHILADELPHIA. CHICAGO. LONDON.

(7)

The Upson-Walton Co.,

155-161 RIVER STREET, CLEVELAND, OHIO,



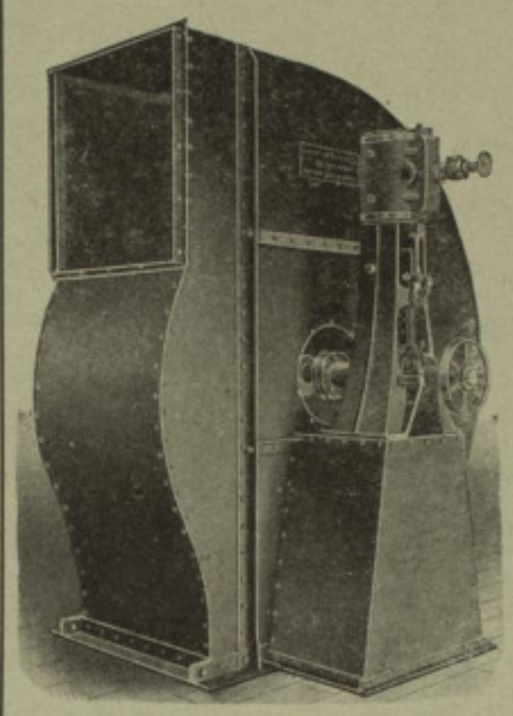
SLEEVE SHOWING CONSTRUCTION.

BALL BEARING SHEAVES, THE LATEST IMPROVEMENT

SELL THE

Cleveland Block

TO BE FOUND ON NEARLY ALL THE MODERN LAKE VESSELS.



Steel Plate Fans

For Ventilation and Mechanical Draft

Send for copy of our sectional catalogue No. 118 N. on Mechanical Draft.

American Blower Co.

DETROIT, MICH.

New York. Chicago. London.

U. S. METALLIC PACKING CO.

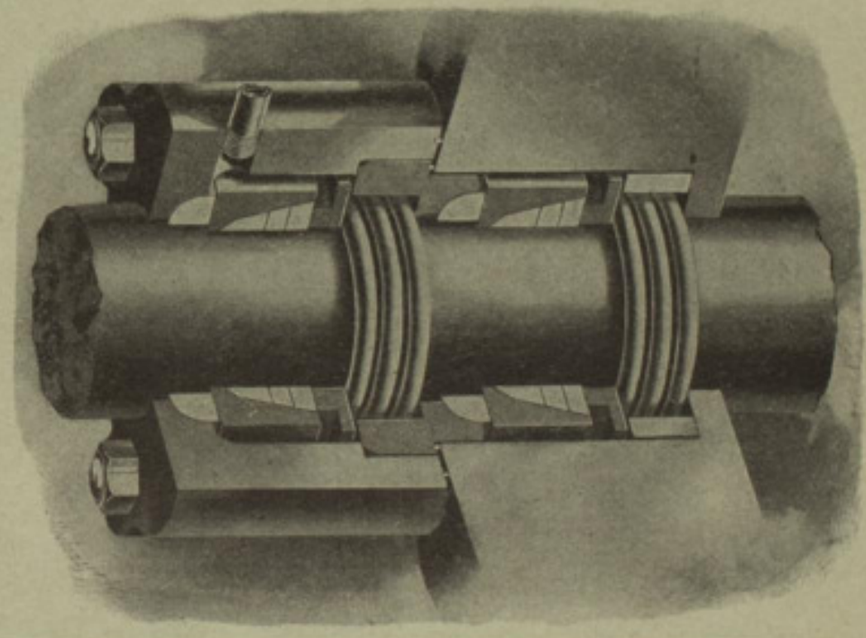
429 N. 13th St. PHILADELPHIA PA.

120,000 PACKINGS IN USE.

12,000 APPLIED IN 1899.

Extensively Used on Ocean, Lake, and Stationary Engines.
Cheap, Durable and Small Cost for Repairs.

Silver Medal Awarded Paris, 1900. SEND FOR CATALOGUE.

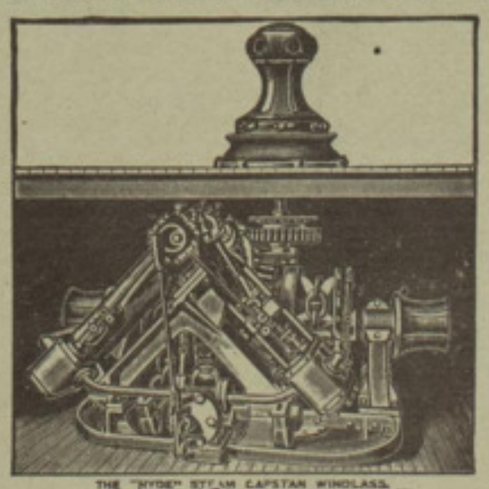


RUBBER COVERED WIRES AND CABLES

WIRE ROPE

CLEVELAND STORE, 88 Superior Street.

WINDLASSES AND CAPSTANS



THE "HYDE" STEAM CAPSTAN WINDLASS.

The Hyde Steam and Power Windlasses and Capstans are the best in the market.

They have been selected for most of the vessels now building for the Navy Department, Revenue Marine, Light-house Board and United States Coast Survey.

They are being furnished for the majority of the highest class Steam Ships, Merchant Vessels and Yachts now building.

HYDE WINDLASS CO., Bath, Me.

LIFE PRESERVERS—BUOYS.

Acme. Solid Cork. Granulated Cork.

EACH PRESERVER stamped by United States Inspector guaranteeing proper buoyancy. Cork Filled Yacht Fenders. Cork Mooring Buoys. Material and Finish Guaranteed. Orders filled promptly.

ARMSTRONG CORK COMPANY,

Boston. New York. Philadelphia. Pittsburg. Chicago. St. Louis. Baltimore.

Midland Towing & Wrecking Co., Ltd.

MIDLAND, ONT., CANADA.

JAMES PLAYFAIR, {Pres't and Gen. Mngr.
D. L. WHITE, Vice-Pres.
J. W. BENSON, Sec'y and Treas.

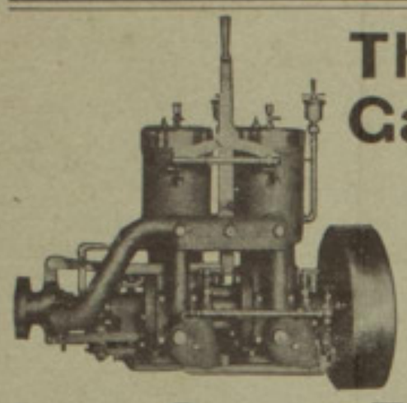
FIRST-CLASS TUGS FOR WRECKING, RAFT TOWING, ETC.

STEAM PUMPS, DIVERS, JACKS, HAWSERS, LIGHTERS.

COLEMAN'S BLOCKS ARE ACKNOWLEDGED THE BEST — 1901 CATALOGUE TELLS THE REST
WE BLOCK THE CUP DEFENDERS — Walter Coleman & Sons, — 1778-1901
NEW WRINKLES — PROVIDENCE, RHODE ISLAND.

MARINE REVIEW

VOL. XXIII. CLEVELAND, O., APRIL 18, 1901. No. 16.



The Superior Marine Gasoline Engine

IS BUILT FOR HEAVY SERVICE.

Every sail boat and steamer should carry one in a tender. Small schooners save tug bills. One in a delivery boat pays for itself the first year. Built in single, double and triple cylinders. Send for catalogue and description of how it acted in a U. S. life-boat.

LAKE SHORE ENGINE WORKS, Marquette, Mich.

The Wm. Cramp & Sons Ship and Engine Building Co.

PHILADELPHIA.

SOLE MANUFACTURERS IN AMERICA OF

Parsons Manganese Bronze AND Parsons White Brass.

EDWARD W. HYDE, President. H. H. McCARTY, Treasurer.
JOHN S. HYDE, Vice-Pres. and Gen'l Supt.

BATH IRON WORKS, Ltd.

Ship Builders and Engineers,

BATH, MAINE.

W. L. BROWN, President.
R. L. IRELAND, Vice-president.
R. C. WETMORE, Sec'y and Treas.
JAS. C. WALLACE, Gen'l Manager.

DRY DOCKS IN CLEVELAND:
No. 1, foot Weddell St., 440 ft. x 50 ft. x 16 ft.
No. 2, foot Weddell St., 300 ft. x 55 ft. x 13 ft.
No. 3, Elm St., 340 ft. x 50 ft. x 13 ft.
Dry Dock at Lorain: 560 ft. x 60 ft. x 17 ft.

The American Ship Building Co.

OFFICE, 120 VIADUCT, CLEVELAND, O.

STEEL SHIPS

MARINE AND STATIONARY ENGINES.
BOILERS AND AUXILIARY MACHINERY.

PROMPT ATTENTION GIVEN TO SHIP REPAIRS OF ALL KINDS.

WORKS AT CLEVELAND AND LORAIN.

ELECTRIC PLANTS FOR YACHTS.

Yachts equipped with our apparatus:

ENTERPRISE, INTREPID, NIAGARA, CLERMONT,
ATALANTA, APHRODITE, ALCEDA, UTOPIA,
MAY, MARGARITA, UTOWANNA, JOSEPHINE.

The Electro-Dynamic Company,

224 Ionic Street, PHILADELPHIA, PA., U. S. A.

CABLE ADDRESS "EDCO." A B C CODE.

WIRE HAWSERS RIGGING

GALVANIZED.
STRONGEST.
MOST SATISFACTORY.

AMERICAN STEEL & WIRE COMPANY, - THE ROOKERY, - CHICAGO, ILL.

ALEXANDER McVITTIE, President and Manager.
WILLIAM C. McMILLAN, Vice-President.
CHARLES B. CALDER, General Superintendent.
M. E. FARR, Secretary and Treasurer.
FRANK E. KIRBY, Consulting Engineer.

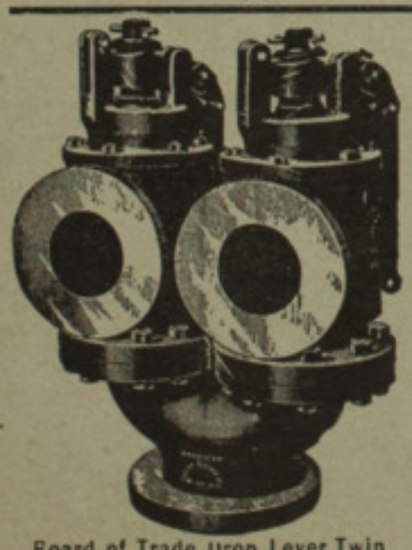
DETROIT SHIPBUILDING COMPANY,

SHIP AND ENGINE BUILDERS,

DETROIT, MICH.

Sole Owners for the Lakes and Atlantic Coast of the HOWDEN HOT DRAFT SYSTEM, as applied to Boilers, giving increased power and great economy.

Steel Ship Yard Located at Wyandotte, Mich.
Wooden Ship Yards and Dry Docks, Foot of Orleans Street, and Foot of Clark Ave., DETROIT, MICH.



Board of Trade Drop Lever Twin Pop Safety Valves.

AMERICAN STEAM GAUGE AND VALVE MNFG. CO.

(Original Steam Gauge Company.)

NEW YORK. BOSTON. CHICAGO.
1 AND 2 RANGOON ST., LONDON, ENG.

MANUFACTURERS OF

Gauges that Gauge, Indicators that Indicate, Pops that Pop.

Clocks, Revolution Counters, Whistles, and all kinds of Steamship Instruments.
Original and only Genuine Thompson Indicator.

HIGHEST AWARD AT THE PARIS EXPOSITION.
The Only American Indicator to Receive a Medal.

TRADE MARK.

SPAR COATING.

A perfect finish for all wood work, spars and iron work exposed to excessive changes in weather and temperature.

EDWARD SMITH & CO.,

Varnish Makers and Color Grinders

45 BROADWAY, NEW YORK.

BULLOCK DYNAMOS AND MOTORS

BULLOCK ELECTRIC MFG. CO.
CINCINNATI, OHIO.

EVERY PACKAGE OF BERTRAM'S POLISH, OIL AND PASTE (except 3 and 8-oz. Cans) CONTAINS ONE OF OUR "20TH CENTURY LUCK COINS." TRY A PACKAGE OF THE BEST POLISH IN THE WORLD AND SECURE YOUR CENTURY'S LUCK. ORDER FROM SHIP CHANDLERS AND ENGINEERS' SUPPLIERS.

BERTRAM'S OIL POLISH CO., BOSTON, MASS.

Bertram's Polish

LUCK FOR 20th CENTURY IN MOST POPULAR POCKET PIECE EVER INVENTED.

HOSE, BELTING, VALVES, ETC., FLAX AND GUM CORE PACKINGS FROM FACTORY TO CONSUMER.

SAYEN & SCHULTZ, Mechanical Rubber Works, PHILADELPHIA, PA.

"MELVILLE" PATENT SHEET GUM WITH WIRE GAUZE INSERTION WILL NOT BLOW OUT.

RUBBER GOODS

THE BROWN HOISTING MACHINERY CO. INCORPORATED

Sole makers of the **"Brownhoist" High Speed Cantilever and Gantry Cranes.** The most economical cranes for covering large areas in steel works or ship yards.

MACHINERY FOR HANDLING
Structural Work, Marine Plates, etc., in ship building yards.

COAL AND ORE HANDLING MACHINERY.

CRANES OF ALL TYPES.
Steam, electric and hand power.

Main Office and Works, CLEVELAND, O., U. S. A.

Eastern Office, 26 Cortlandt St., New York City. Pittsburg Office, Carnegie Building, Pittsburg, Pa. European Office, 39 Victoria St., London, S. W.

GENERATORS — ELWELL-PARKER ELECTRIC CO. OF AMERICA MANUFACTURERS GUARANTEES QUALITY CLEVELAND, OHIO. — MOTORS

STANDARD MARINE GENERATING SETS. COMPLETE HOISTING AND POWER PLANTS.

AMERICAN SHIP WINDLASS CO.,

P. O. Box 53, **PROVIDENCE, R. I.**

Send for Catalogue. Address FRANK S. MANTON, Agent.

Ship Machinery.

Sole Builders of the ORIGINAL and ONLY AUTOMATIC STEAM TOWING MACHINE.

WILLIAM L. BROWN, President. B. W. WELLS, Vice-President. O. R SINCLAIR, Sec'y and Treas. JOHN A. UBSDELL, Jr., Genl. Mngr.

CHICAGO SHIP BUILDING COMPANY,

Long Distance Telephones.
Ship Yard and Dry Dock Office, "South Chicago 40."
Chicago Office, 1125 Rookery, "Harrison" 1207.

STEEL SHIP BUILDERS AND DRY DOCK PROPRIETORS.

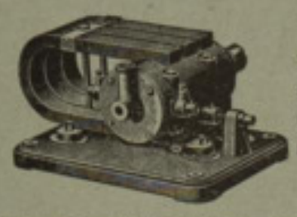
Dry Dock and Yards: 101st St. and Calumet River, CHICAGO, ILL.

Standard Automatic Releasing Device.

THE FALLS ARE SO ROVE THAT BOTH ENDS OF THE BOAT DETACH, IRRESPECTIVE OF WHICH END STRIKES THE WATER FIRST.

Will release a boat immediately in the roughest sea or under speed and can be hooked on without delay or injury to the hands of men hooking it on.

Standard Automatic Releasing Hook Co.,
NEW CHEESEBROUGH BUILDING,
17 State Street, New York, N. Y



A BIG FAT SPARK EVERY TIME
if you use our Magneto Igniter. Expense and annoyance of batteries avoided, and continuous, satisfactory operation of gas or gasoline engine assured. Special styles for automobiles and launches.

Send for our new booklet X for full particulars. It will interest you.

THE HOLTZER-CABOT ELECTRIC CO., BOSTON, (Brookline) MASS.
New York Office, 115 Broadway. Chicago Office, 397 Dearborn St.

Three Excellent Little Books FOR MARINE ENGINEERS.

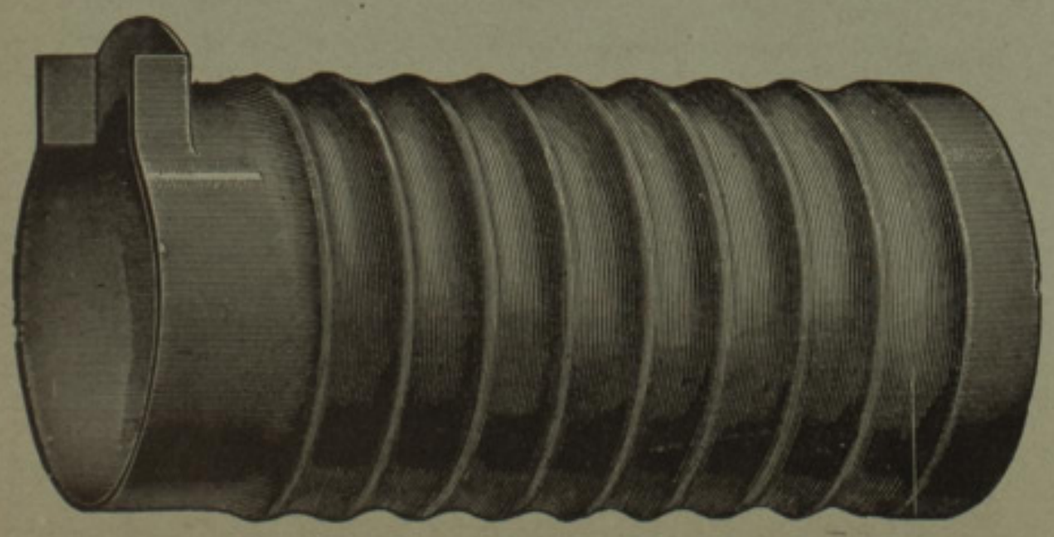
"KEY TO ENGINEERING."

"WHAT AN ENGINEER SHOULD KNOW ABOUT ELECTRICITY."

"ENGINEER'S EPITOME."

Any one of these is worth a dollar. All three may be had for a dollar from the Marine Review Pub. Co., 418-419 Perry-Payne Building, Cleveland.

MORISON SUSPENSION BOILER FURNACES



—FOR—

LAND and MARINE BOILERS.

UNIFORM THICKNESS—EASILY CLEANED
UNEXCELLED FOR STRENGTH.

Also Fox Corrugated Furnaces.

Manufactured by

THE CONTINENTAL IRON WORKS,

West and Calyer Sts. NEW YORK
Near 10th and 23d Sts. Ferries. Borough of Brooklyn

THE "LONG ARM" SYSTEM CO.

Cor. Lake and Wason Sts., CLEVELAND, O., U S. A.

BUILDERS OF

PNEUMATIC AND ELECTRIC | Safety Power Doors and Hatch Gears for Ships.

SPECIAL AIR COMPRESSORS FOR MARINE WORK.

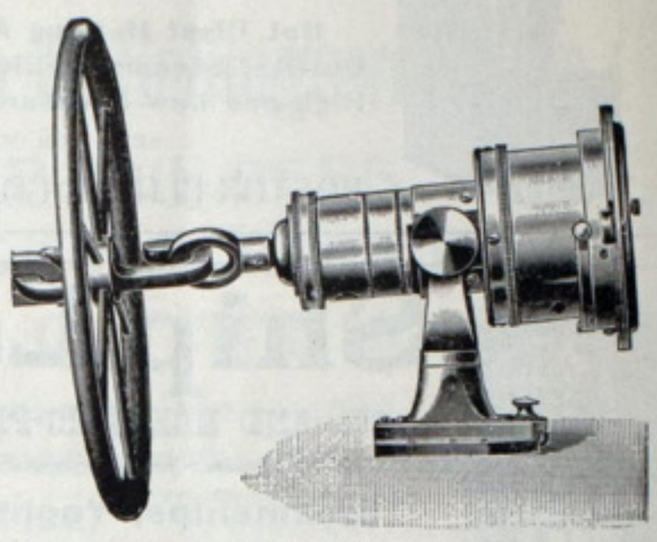
THOMAS WALKER & SON,

BIRMINGHAM, ENGLAND.

THE "NEPTUNE" SHIP-LOG WITH BALL BEARINGS FOR HIGH SPEEDS.

Particulars on Application.

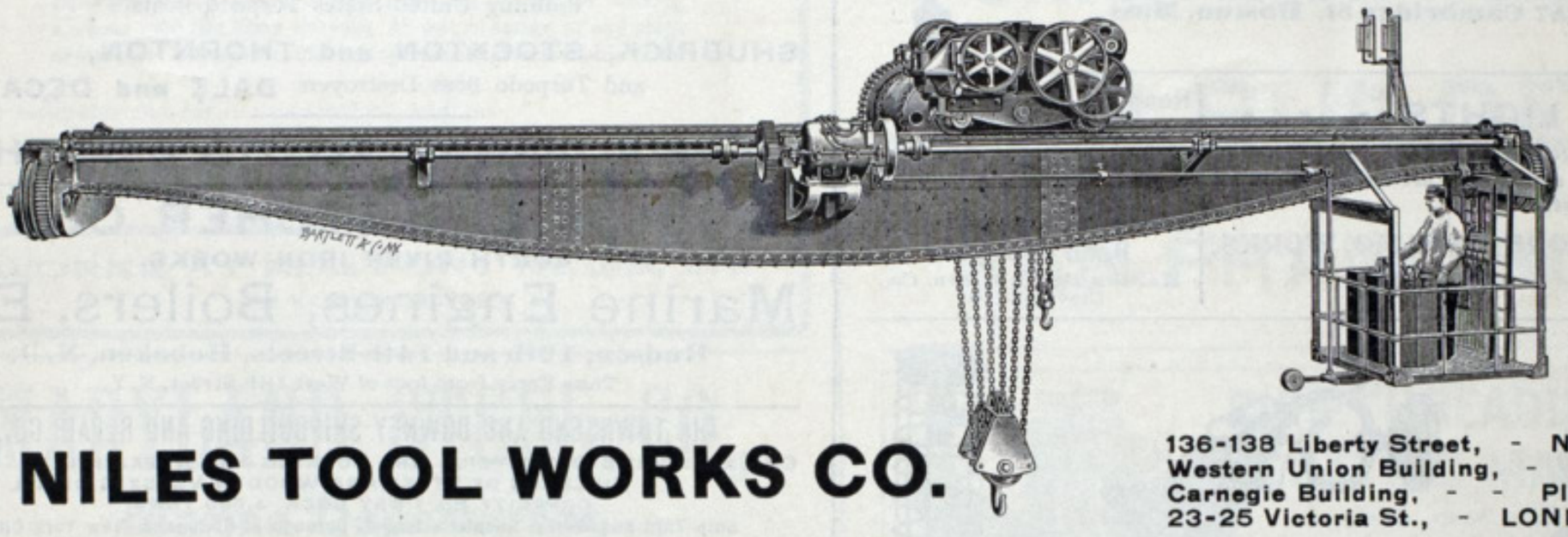
SOLD BY ALL SHIP CHANDLERS.



As used in the British Navy.

REASONABLE DELIVERIES

NILES ELECTRIC TRAVELING CRANES.



BUILT ON LATEST AND MOST IMPROVED DESIGNS.

APPLY TO

NILES TOOL WORKS CO.

136-138 Liberty Street, - NEW YORK.
Western Union Building, - CHICAGO.
Carnegie Building, - - PITTSBURG.
23-25 Victoria St., - LONDON, ENG.

A Complete Plant for Steel Ship Building

IS OFFERED FOR RENT

by the Estate of Hugh Ramsay, Perth Amboy, N. J.

Includes well-equipped Machine and Blacksmith Shops, Plate and Angle Shops and Mould Loft.

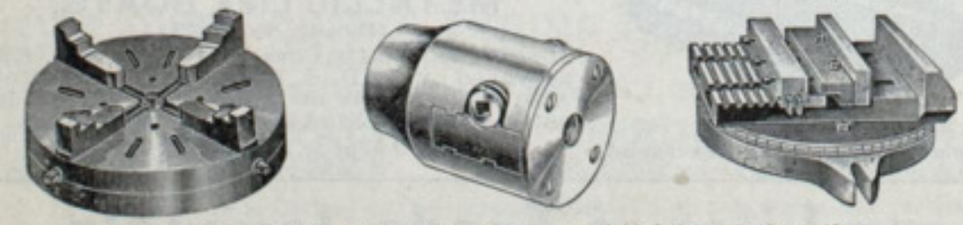
WITHIN TWENTY-FIVE MILES OF NEW YORK CITY AND WITHIN THE LIMITS OF AN EXCELLENT HARBOR.

Forty feet of water at low tide in front of the yard.

Address P. O. Box 23, Perth Amboy, N. J.

SKINNER CHUCKS

For LATHES, DRILLS and PLANERS



A finely illustrated Catalogue, 6 x 9, sent to interested parties.

THE SKINNER CHUCK CO., 340 CHURCH STREET. NEW BRITAIN, CONN.

Monongahela Iron and Steel Co.

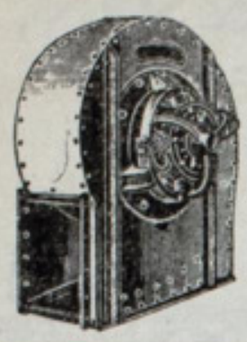
MANUFACTURERS OF

CHARCOAL BAR IRON **CARTER BRANDS** CHARCOAL IRON CHAINS

ALL SIZES.

United States Government Specifications Guaranteed.

PITTSBURGH, PA.



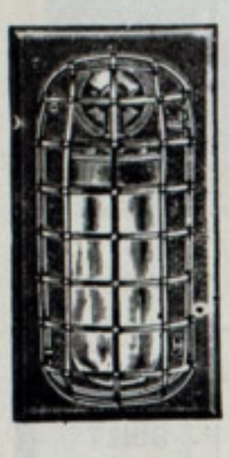
Fan and Pressure Blowers.

EXHAUST FANS FOR ALL USES.

Hot Blast Heating Apparatus, Dry Kiln Outfits, Steam and Electric Fans, Forges, High and Low Pressure Engines.

SEND FOR CIRCULARS.

BOSTON BLOWER CO., Hyde Park, Mass.



Ship Lamps

OIL AND ELECTRIC FIXTURERS

— FOR —

Steamships, Yachts, &c.

GREAT VARIETY OF DESIGNS.

Prices and Cuts on Application.

PAGE BROS. & CO.

347 to 357 Cambridge St. Boston, Mass.

SEARCH LIGHTS - - -

RUSHMORE PROJECTORS are in almost exclusive use in all classes of service, and are specified for finest Steamers and Yachts.

RUSHMORE DYNAMO WORKS,

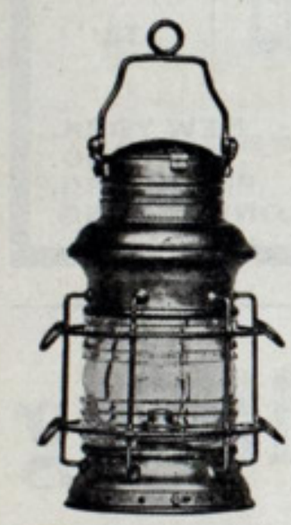
TELEPHONE 559. JERSEY CITY.

Reed's Engineers' Hand Book.

Reed's Guide to Examinations.

Key to Reed's Engineers' Hand Book.

MARINE REVIEW PUB. CO., Cleveland, O.



MARINE LIGHTING EQUIPMENT.

WM. PORTER'S SONS' CO.

F. J. RUSSELL, Electrical Engineer. 271 Pearl St., NEW YORK.

NEVERSINK CORK JACKET AND LIFE BELT.

Warranted 24 pounds. Buoyancy and full Weight of Cork, as required by U. S. Inspectors.

Consolidated Cork Life Preservers. Ring Buoys and Fenders.

SAFEST, CHEAPEST.

Approved and adopted by U. S. Board of Supervising Inspectors. Also adopted by the principal Ocean, Lake and River Steamer Lines as the only Reliable Life Preserver.

Awarded four Medals by World's Columbian Exposition.

Metallic and Wooden Life Boats.

Metallic Life Rafts. Marine Drags.

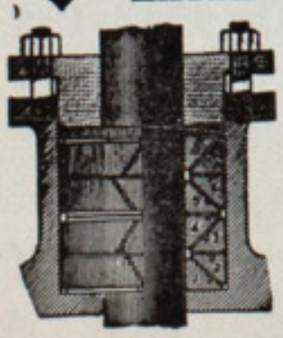
Manufacturers of Woolsey's Patent Life Buoy—the lightest, cheapest and most compact Life Raft known.

DAVID KAHNWEILER'S SONS

437 Pearl Street, NEW YORK CITY.

Send for Illustrated Catalogue.

KATZENSTEIN'S Self-Acting METAL PACKING,



For PISTON RODS, VALVE STEMS, etc., of every description, for Steam Engines, Pumps, etc., etc.

Adopted and in use by the principal Iron Works and Steamship Companies, within the last twelve years, in this and foreign countries.

FLEXIBLE TUBULAR METALLIC PACKING, for slip-joints on Steam Pipes, and for Hydraulic Pressure; also METAL GASKETS for all kinds of flanges and joints.

DOUBLE-ACTING BALANCED WATER-TIGHT BULKHEAD DOORS for Steamers. Also Agents for the McColl Cumming PATENT LIQUID RUDDER BRAKE. For full particulars and reference, address:

L. KATZENSTEIN & CO.,

General Machinists, Brass Finishers, Engineers' Supplies,

357 West St., New York.

THE LOCKWOOD MANUFACTURING CO.

IRON WORKS AND DOCKS,

61 to 85 Sumner Street, EAST BOSTON, MASS.

BUILDERS OF

Steamships, Tow Boats and Marine Engines.

REPAIRING OF EVERY DESCRIPTION.

Builders of the Celebrated **LOCKWOOD PROPELLER WHEELS.**

WM. R. TRIGG COMPANY,

SHIP BUILDERS, RICHMOND, VA.

Government Contractors,

Building United States Torpedo Boats

SHUBRICK, STOCKTON and THORNTON,

and Torpedo Boat Destroyers **DALE and DECATUR.**

SHIPBUILDING IN ALL ITS BRANCHES.

W. & A. FLETCHER CO.

NORTH RIVER IRON WORKS.

Marine Engines, Boilers, Etc.

Hudson, 12th and 14th Streets, Hoboken, N. J.

Take Ferry from foot of West 14th Street, N. Y

THE TOWNSEND AND DOWNEY SHIPBUILDING AND REPAIR CO.,

ENGINEERS AND OUTFITTERS, DRY DOCKING AND REPAIRING.

BUILDERS OF STEEL AND WOODEN VESSELS OF ALL TYPES.

CAPACITY No. 1 DRY DOCK, 4,000 TONS.

Ship Yard and Works, Shooter's Island, Borough of Richmond, New York City.

New York Offices, 22 and 23 D. Produce Exchange.

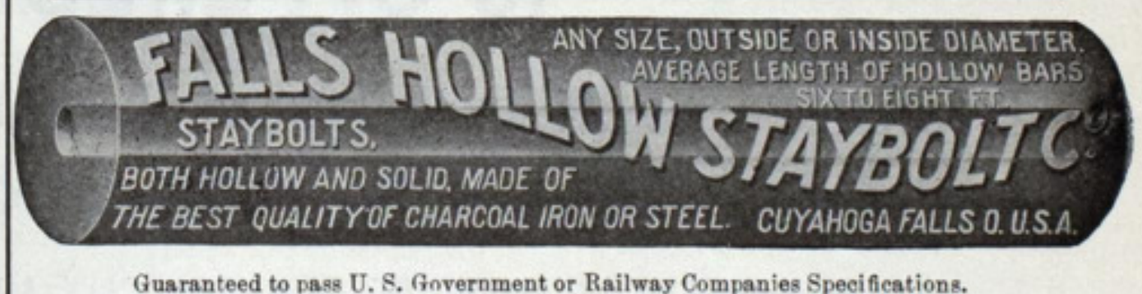
Cable Address: "TEEANDE," N. Y. TELEPHONE CALLS: N. Y. Office, 500 Broad. Yard and Works, 97 West Brighton.

JOHN B. HARDY, BUILDER OF STEAM VESSELS

EITHER STEEL OR WOOD.

All kinds of Marine Engines and Machinery. Finest Equipped Shop on Puget Sound. Marine Shears of 125 tons capacity. First-class rail facilities.

TACOMA, WASHINGTON.



Guaranteed to pass U. S. Government or Railway Companies Specifications.

THOS. DREIN & SON

TATNALL AND RAILROAD STS. WILMINGTON, DEL.

Builders of Metallic Life Boats and Rafts, Yachts and Pleasure Boats.

Life Preservers.

Outfit for Lake Steamers a Specialty.

Telephone Call 340-B, Greenpoint.

LANE & DeGROOT,

METALLIC LIFE BOATS,

(Formerly Raymond's)

Metallic Life Rafts, Cork Life Preservers, Etc., approved by the U. S. Supervising Inspectors. Also Wood Boats of Every Description. Repairing of every kind promptly attended to.

70 and 72 Kent St., BROOKLYN, NEW YORK.

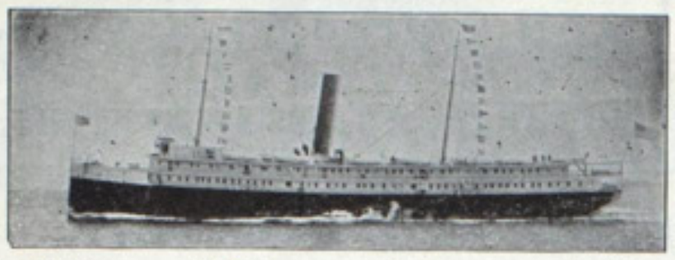
Keep Files of Trade Journals.

A handy and substantial binder, into which each issue may be securely and neatly placed with trifling effort, may be had at $1. Thousands of them in use.

The only device that has proven satisfactory for this purpose.

THE MARINE REVIEW PUB. CO., Perry-Payne Building, Cleveland.

ROACH'S SHIP YARD.



DELAWARE RIVER
IRON
SHIP-BUILDING & ENGINE WORKS,
CHESTER PA.

Builders of Steamships and Marine Machinery.

SHIP-BUILDING IN ALL ITS BRANCHES.

New York Office, Morgan Iron Works, Foot East Ninth St

SHIP AND ENGINE BUILDERS.

Newport News Shipbuilding and Dry Dock Company.

Equipped with a Simpon's Basin Dry Dock capable of docking a vessel 600 feet long drawing 25 feet of water, at any stage of the tide Repairs made promptly and at reasonable rates.

For estimates and further particulars, address

C. B. ORCUTT, President,
NO. 1 BROADWAY, NEW YORK.

WORKS AT NEWPORT NEWS, VA.
(ON HAMPTON ROADS.)

MARYLAND STEEL CO.,

Marine Department.

Ship Builders and Engineers

SPARROW'S POINT, MD.

Baltimore Telephone No. 11. A. G. WILSON, Manager.

Long Distance Telephone Service Between New York, Philadelphia, Boston and Sparrow's Point Offices.

New York Office: 71 Broadway. Boston Office: 70 Kilby Street.
Philadelphia Office: 312-319 Girard Building.

The Pusey & Jones Company,

WILMINGTON, DELAWARE.

Builders of **IRON AND STEEL STEAMERS, STEAM YACHTS, TOW BOATS, MARINE ENGINES, BOILERS, TANKS, AND OF HEAVY MACHINERY GENERALLY.**

ALSO COPPERSMITH WORK.

SPECIAL FACILITIES for REPAIRS to both WOODEN and METAL BOATS.

MARINE RAILWAY. NO WHARFAGE CHARGED.

Risdon Iron Works,

IRON AND STEEL SHIP BUILDERS,

SAN FRANCISCO.

FORE RIVER SHIP & ENGINE CO, ENGINEERS AND SHIPBUILDERS.

QUINCY, MASS., U. S. A.

FAST STEAM YACHTS. MERCHANT VESSELS.
MARINE ENGINES. WATER-TUBE BOILERS.

U. S. Torpedo-Boat Destroyers Lawrence and Macdonough now under construction.

FARRAR & TREFTS,

Propeller, Yacht and Tug Wheels.
Marine and Stationary Engines & Boilers.
Repairing Promptly Attended to.
Drilling Boilers and Engines a Specialty.

64 to 66 Perry Street, BUFFALO, N. Y.

WORKS AND MAIN OFFICE, WILMINGTON, DEL.

The Harlan & Hollingsworth Co.

SHIP BUILDERS, DRY DOCKING, REPAIRING AND OUTFITTING.

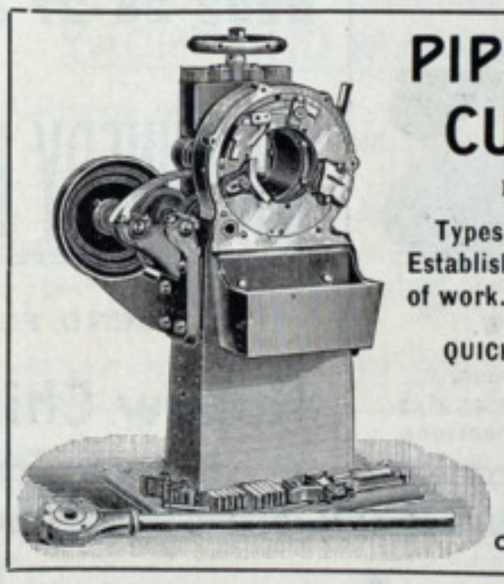
(3-4 CENTURY EXPERIENCE.)

NEW YORK OFFICE, { EXCHANGE COURT BUILDING, 52 BROADWAY, ROOM 702.

UNION IRON WORKS

SHIP BUILDERS,

SAN FRANCISCO.



PIPE THREADING AND CUTTING MACHINES

HAND OR POWER.

Types combining all that is LATEST and BEST. Established reputation for durability and rapidity of work.

GREAT RANGE OF WORK.
QUICK CHANGE FROM SIZE TO SIZE OF PIPE.
GEARS COMPLETELY HOUSED.

MERRELL MNFG. CO.

SEND FOR CATALOGUE R. Toledo, Ohio, U. S. A.

MATHIAS SEDDINGER, President.
SOMMERS N. SMITH, Vice-Pres't and Gen'l Mgr. ESTABLISHED 1838.

THE NEAFIE & LEVY SHIP & ENGINE BUILDING COMPANY,

PENN WORKS.

IRON AND STEEL SHIP AND MARINE ENGINE BUILDERS.

SOLE MAKERS OF THE WELL KNOWN

PHILADELPHIA PROPELLER WHEEL.

Beach and Palmer Streets, PHILADELPHIA, PA., U. S. A.

The Atlantic Works, BUILDERS OF ..... STEAMSHIPS, STEAM YACHTS, TOW BOATS, ETC.

EAST BOSTON, MASS.

Marine Engines, Boilers and Tanks,
Heavy Machinery and Plate Iron Work.

LEWIS NIXON, SHIP BUILDER

Office and Works, ELIZABETH, N. J.

Builder of Stern-wheel, Paddle and Screw Steamers; also Torpedo Boats and Barges of all kinds in Steel.

A Specialty made of South American and Alaskan River Boats.

SPECIFY
CRANE FITTINGS
WRITE FOR POCKET CATALOGUE
NEW YORK PHILADELPHIA CINCINNATI KANSAS CITY SIOUX CITY OMAHA
CRANE CO.
CHICAGO
ESTABLISHED 1855
ST. PAUL ST. LOUIS LOS ANGELES SAN FRANCISCO PORTLAND, ORE.

Patterson's Nautical Encyclopedia.

Will be in all respects a work up to date, correct as to every term known to the shipping world.

Divided as to departments of Naval Architecture, Marine Engineering, etc.

The latest and bound to be the most complete work of its kind. Best effort of Howard L. Patterson, New York, author of several standard books on marine subjects.

NOW IN PRESS. $3 PER COPY.

Order from THE MARINE REVIEW PUB. CO., CLEVELAND.

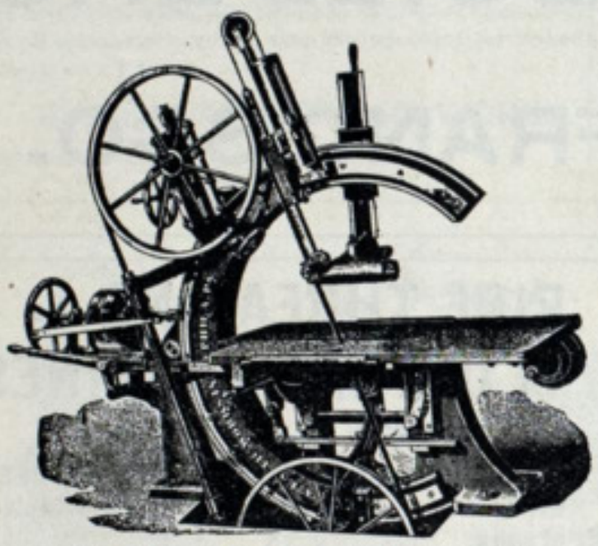
WILSON & SILSBY, Rowe's Wharf, BOSTON, MASS.

We furnished the Sails for DEFENDER, COLONIA, JUBILEE, NAVAHOE.

PARTICULAR ATTENTION GIVEN TO
SAILS FOR RACING YACHTS.
ALSO THE
OUTFITS OF LARGE STEAM YACHTS.

THE CHASE MACHINE COMPANY,
Engineers and Machinists,
MANUFACTURERS, UNDER THE CHASE PATENTS OF
FOG WHISTLE MACHINES, HOISTING ENGINES,
STEERING ENGINES, AUTOMATIC TOWING ENGINES.
POWER AND DROP HAMMERS, AND OTHER MACHINERY
ENGINEERS' SUPPLIES, AND GENERAL JOB WORK.
TELEPHONE MAIN 994. 111 Elm Street CLEVELAND, OHIO.

Chicago Nautical School,
MASONIC TEMPLE, CHICAGO.
W. J. WILSON, Principal. (Late Lieutenant, U. S. N.)
A full and complete course of instruction in Lake and Ocean navigation. Also special branches taught those desiring to qualify themselves for better positions in the Marine Service. Students taught by correspondence. Students may begin at any time.

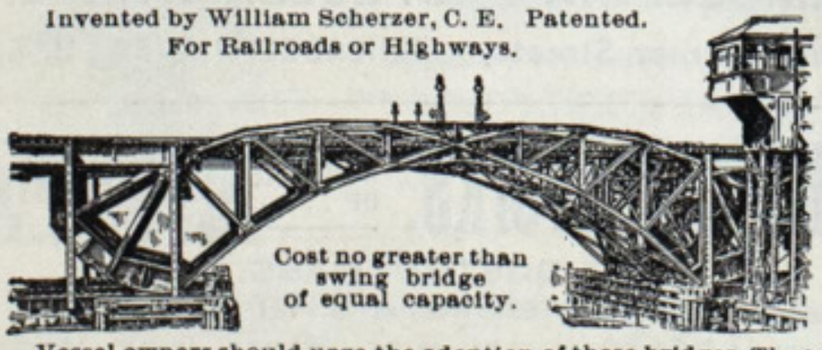


ADJUSTABLE BEVEL BAND SAW.
Will bevel both ways to 45 degrees.
Power movement to change angles.
Power feed in three directions.

ESTABLISHED 1869. INCORPORATED 1896.
ATLANTIC WORKS INCORPORATED,
Successors to Berry & Orton Company.
2223-25-27 & 29 Arch St., PHILADELPHIA, PA., U. S. A.
MANUFACTURRS OF
MACHINERY FOR WORKING WOOD FOR USE IN SHIP YARDS, CAR SHOPS, RAILROAD SHOPS.
SEND FOR CATALOGUE. ESTIMATES FURNISHED.
Hollow Chisel Mortisers. Car Sill Dressers.

Westinghouse Electric & Mfg. Co.
PITTSBURG, PA.
Design, Construct and Install Apparatus guaranteed to work satisfactorily under the most exacting conditions.
Special attention given to Apparatus intended for Ship Yards.

THE SCHERZER ROLLING LIFT BRIDGES
Invented by William Scherzer, C. E. Patented.
For Railroads or Highways.



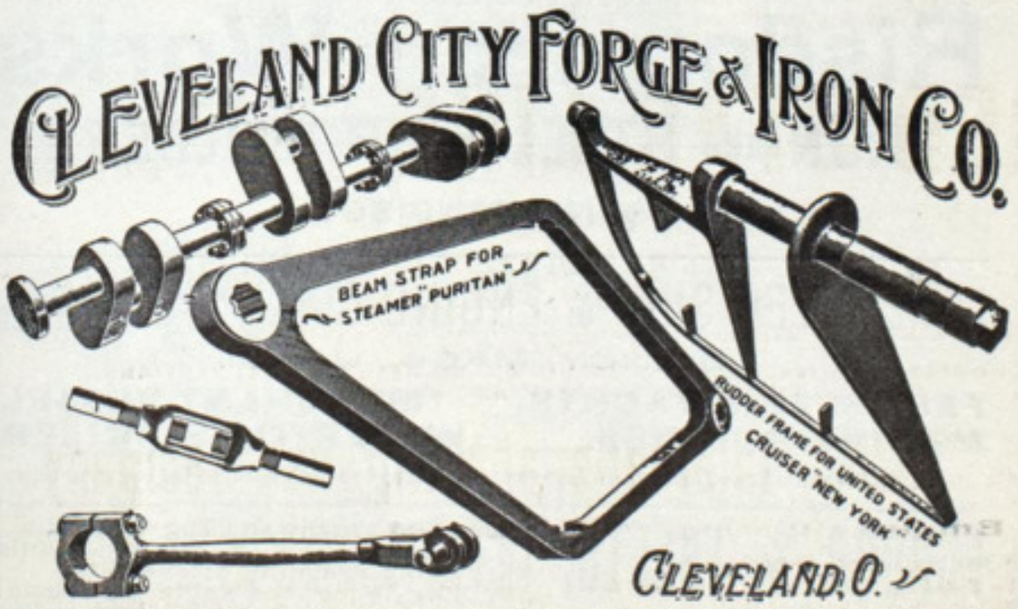
Cost no greater than swing bridge of equal capacity.

Opened or Closed in Twenty Seconds.

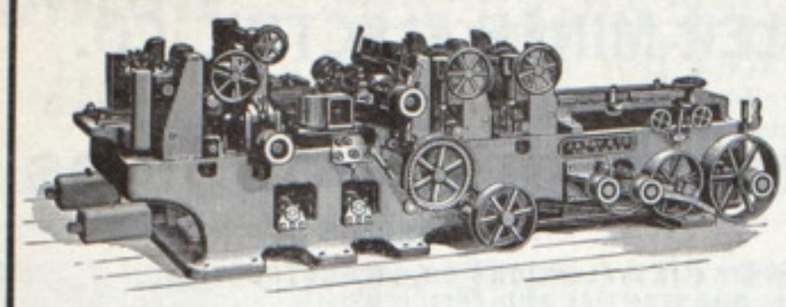
Vessel owners should urge the adoption of these bridges. The 8-track Scherzer Bridge over the Chicago Drainage Canal is the largest movable bridge in the world. A number in SUCCESSFUL operation, and several in process of construction.
SCHERZER ROLLING LIFT BRIDGE CO.,
1616 Monadnock Block, Chicago, Ill.

TRY IT ON YOUR BOAT.
A genuine Varnish Paint without gum. Where applied the surface becomes coated as with glass, resisting the influence of weather and of water (salt or fresh) and keeping its gloss for years.
JOHN MAIR & SON. 136 S. Delaware Ave., PHILADELPHIA, PA.

CLEVELAND CITY FORGE & IRON CO.



CLEVELAND, O.
IRON OR STEEL FORGINGS FINISHED COMPLETE, ROUGH MACHINED OR SMOOTH FORGED ONLY, OF ANY WEIGHT
COUPLING LINKS AND PINS PRESSED WROUGHT IRON TURNBUCKLES. CAR IRON SPECIALTIES.



No. 15 LIGHTNING FLOORER.

Patented March 20, 1900.

Will plane 4 sides, 9 to 14 inches wide and 6 inches thick.

The feed consists of six rolls 8″ in diameter, very powerful.

Wood-Working Machinery

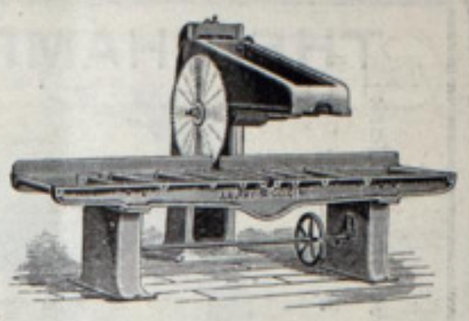
ESPECIALLY ADAPTED FOR SHIP BUILDING AND NAVY YARDS.

"GRAND PRIX" PARIS 1900.

SINGLE MACHINES.
COMPLETE EQUIPMENTS.

J. A. FAY & EGAN CO.,

325-345 W. Front St., CINCINNATI, O.



WALL BRACKET CUTTING OFF SAW.

Used for sawing to accurate dimensions the heaviest timbers required in Ship and Navy Yards. Will cut 30″ wide and 12″ thick.

Thearle's Works ON SHIP BUILDING.

STANDARDS IN ENGLAND AND SCOTLAND

KNOWN AND USED WHEREVER STEEL SHIPS ARE BUILT.

SEPARATE VOLUMES FOR PLATES.

"Ship Building in Iron and Steel." (Plates in separate volume.) $5.25.
"Ship Building and Laying Off." (Plates in separate volume.) $3.00.
"Theoretical Naval Architecture." (Plates in separate volume.) $3.50.

THE MARINE REVIEW PUB. CO., CLEVELAND.

Illustrated Nautical Encyclopedia.

A WORK IN ALL RESPECTS UP TO DATE.

By HOWARD PATTERSON, Principal of New York Nautical College.

ORDER NOW. IT IS IN PRESS.

Not a Dictionary of Sea Terms alone. It is complete from the standpoint of the Naval Architect and Marine Engineer.

PUBLISHED BY
The Marine Review Pub. Co., Cleveland, O.

ARE YOU AWARE THAT

Crandall's Modern Marine Railways

are the most ideal form of dry dock for working on a ship's bottom?

SAFE. RAPID. COMPLETELY EQUIPPED.

H. I. CRANDALL & SON,

Engineers and Builders,

100 Border Street, EAST BOSTON, MASS.

ELLIS MARINE PLUMBING CO.

(INCORPORATED.)

YACHT AND MARINE PLUMBERS.

Manufacturers of and agents for **Modern Plumbing, Fixtures, Drainage Tanks, Ejectors, etc.**

Inventors of the

ELLIS SYSTEM,

Positively the most sanitary and modern Plumbing ever installed on board vessel. No pumps are required at any of the fixtures above or below the water line. WRITE FOR PARTICULARS.

ESTIMATES FURNISHED. 32 BROADWAY, NEW YORK

ELECTRIC AUTOMATIC WHISTLE OPERATOR

will operate whistle from any distance with ease and certainty.

WHISTLE BLAST RECORDERS will prove invaluable in cases of collision or grounding through crowding or other causes. **STEAM SHIP WHISTLES** in all sizes to operate with steam or air. It will pay you to investigate our novel improvements. Catalogues mailed to captains, owners or engineers, upon application.

THE SIGNAL & CONTROL CO., 24-27 WEST STREET NEW YORK, U. S. A

AMERICAN LINE

NEW YORK
SOUTHAMPTON
LONDON

CALLING AT CHERBOURG WESTBOUND.

Sailing From New York Every Wednesday at 10 A. M.

Steamers: ST LOUIS, ST PAUL, NEW YORK, PHILADELPHIA.

Special Express Train from **Southampton** to **London** in one hour and forty minutes.
Close connection at SOUTHAMPTON for **Havre** and **Paris** by special fast twin-screw Channel Steamers.

RED STAR LINE

NEW YORK
ANTWERP
. . . . PARIS

Sailing Every Wednesday at 12 Noon.

Steamers: **VADERLAND, *ZEELAND, KENSINGTON, SOUTHWARK, FRIESLAND.*

* New Twin-screw Steamers calling at Cherbourg eastbound.

One of the Shortest Routes to BELGIUM, HOLLAND, FRANCE, GERMANY, THE RHINE, SWITZERLAND and ITALY.

Send for "Facts for Travelers." **International Navigation Company**

Empire Building, 73 Broadway, New York.

305-307 Walnut St., Philadelphia.
Fiske Building, 89 State Street, Boston.
1306 F St., N.W., Washington, D. C.
Cor. Dearborn & Washington Sts., Chicago.
Third and Pine Streets, St. Louis.
10-12-14 Washington Ave., S., Minneapolis.
30 Montgomery St., San Francisco.

PIERS: 14 & 15 NORTH RIVER, FOOT OF FULTON ST., NEW YORK.

Chas. E. & W. F. Peck,

58 William St., NEW YORK CITY. Royal Insurance Building, CHICAGO, ILL.

C. T. BOWRING & CO.,

5 and 6 Billiter Avenue, E. C., LONDON, ENG.

INSURANCE

BROWN & CO., . . 202 Main Street, Buffalo, N. Y.
A. A. & B.W. PARKER, 15 Atwater St., W., Detroit, Mich
J. G. KEITH & CO., 138 Rialto Building, Chicago, Ill.
LA SALLE & CO., Board of Trade Bldg., Duluth, Minn.

Are prepared to make rates on all classes of Marine Insurance on the Great Lakes, both CARGOES and HULLS.

GREAT LAKES REGISTER

INCORPORATED

COMBINED AND ISSUED IN CONNECTION WITH THE

BUREAU VERITAS

INTERNATIONAL REGISTER OF SHIPPING.

GREAT LAKES REGISTER DESIRES TO ANNOUNCE THAT ITS RATINGS GO BEFORE THE LEADING UNDERWRITERS OF AMERICA ENGLAND AND FRANCE.

THE SERVICES OF ITS SURVEYORS MAY BE ENGAGED ON HULL AND CARGOES.

F. D. HERRIMAN, SURVEYOR GENERAL,
320-322 PERRY-PAYNE BUILDING, CLEVELAND O

THE CHAMPION RIVET CO.

Government Work a Specialty

Quality: Highest Standard. Finish: Unexcelled.

CLEVELAND, O., U. S. A.

VICTOR BOILER AND STRUCTURAL RIVETS.

SEIDLER-MINER ELECTRIC CO.

DETROIT, MICH.

Electric Lighting of Ships

OUR SPECIALTY.

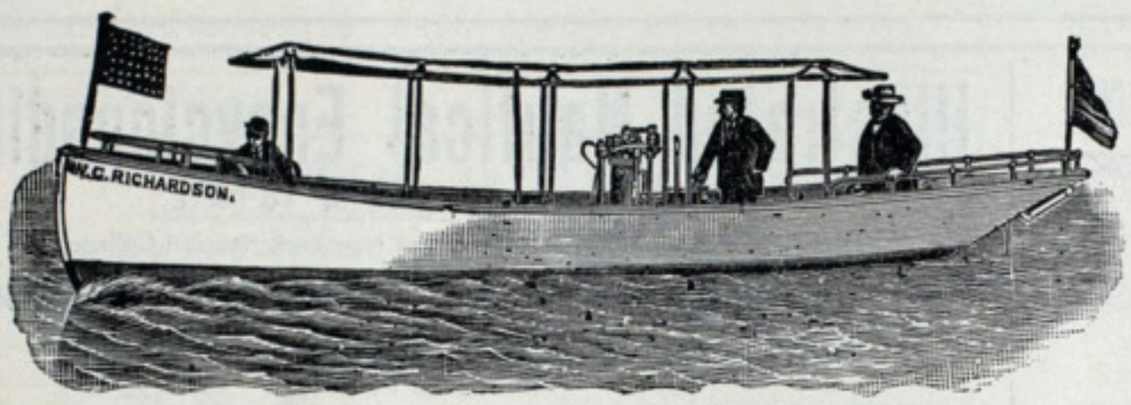
COMPLETE INSTALLATIONS OR RECONSTRUCTION, SAFE, SUBSTANTIAL AND EFFICIENT.

DEALERS IN

Marine Electrical Supplies AND Special Fittings.

Catalogue and Marine Rules on application.

THE "WOOTTERS" GASOLINE MARINE ENGINES



Launch W. C. RICHARDSON.

Built for Hausheer & Sons, Cleveland, O. Dimensions, 35 x 8 O. A. Engine 8 horse power.

ALWAYS RELIABLE.

Especially adapted for Launches, Fish Tugs and Ferry Boats.

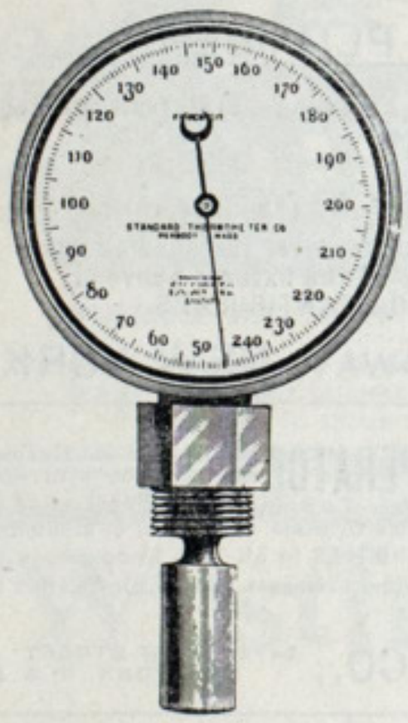
Catalogue, Prices and Particulars furnished on application.

Engines of the Stationary Type built suitable for all purposes requiring from 4 to 100 horse power, where a reliable and efficient power is required.

ENGINES BUILT BY

THE McMYLER MANUFACTURING CO.,

180 Columbus Street, CLEVELAND, O.



Helios-Upton Comp'y,

PEABODY, MASS.

Hot Water Thermometers and Thermometers for Mechanical Purposes.

Used by U. S. Navy in all New Ships.

Eighty of them furnished the Japanese Cruisers "Kasagi" and "Chitose."

SEND FOR BULLETIN No. 40 A.

The Bessemer Steamship Company

Solicits Catalogues, Prices and Discounts from manufacturers and wholesale dealers in Ship Machinery, Brass Goods, Rope, Paints, Asbestos, Packing, Hose, Furniture, Piping, Glass and Crockery, Tinware, Ranges, Carpeting, Bedding, Life-Preservers, Rafts and Boats, Engineers' Supplies and Tools, Carpenters' Tools, Electric Supplies, Lamps, Grate Bars, Castings, etc., etc., etc.

ALSO QUOTATIONS from Market men and Grocers on the Lakes for Provisions and Meat, best quality only.

CATALOGUES without quotations are not wanted.
ALL GOODS except provisions to be delivered in Cleveland.

Address L. M. BOWERS, General Manager,
CLEVELAND, OHIO.

DELTA METAL

REG TRADE MARKS

THE PHOSPHOR BRONZE SMELTING CO. LIMITED, 2200 WASHINGTON AVE., PHILADELPHIA.
"ELEPHANT BRAND PHOSPHOR-BRONZE"
INGOTS, CASTINGS, WIRE RODS, SHEETS, ETC.
—DELTA METAL—
CASTINGS. STAMPINGS AND FORGINGS.
ORIGINAL AND SOLE MAKERS IN THE U.S.

PROPELLERS.

The Martin-Barriss Co.

IMPORTERS AND MANUFACTURERS OF

Mahogany, White Mahogany,

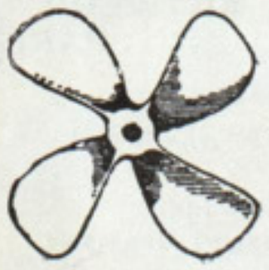
AND ALL NATIVE CABINET WOODS.

HIGH GRADES OF KILN DRIED WOODS FOR CABIN WORK AND INSIDE TRIM.

White Oak Timbers and Plank,

CONSTANTLY ON HAND AND SAWED TO ORDER ON SHORT NOTICE.

654 Seneca Street, Cleveland, O.



MacKinnon Manufacturing Co.

Boilers Makers, Founders and Machinists.

Marine Boilers, Engines and Shipyard Machinery. Most powerful set of Hydraulic Slings on the Lakes. Best Towing and Speed Propeller Wheels made.

SPECIALTY SMALL YACHT WHEELS.

Works and Office, 224-230 N. Water Street, BAY CITY, MICH.

S. F. HODGE & CO.

MARINE ENGINES,
PROPELLER WHEELS,
DECK HOISTERS,
MARINE REPAIRS.

320 ATWATER STREET,
DETROIT, MICH.

DIXON'S GRAPHITE PIPE JOINT COMPOUND

Enables you to MAKE A TIGHTER JOINT than you can possibly make with red lead. You can do it easier, and parts can be separated at any time without breaking anything. Send for sample and circular.

JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY, N. J.

DIXON'S Lubricating Graphite

Is fully explained in an INTERESTING AND INSTRUCTIVE PAMPHLET which is FREE to all interested. It will pay all Engineers and Machinists to SEND FOR IT.

JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY, N. J.

Pure Feed Water.

Clean Boilers.

Lower Fuel Bills.

Reynolds Feed Water Heater and Purifier

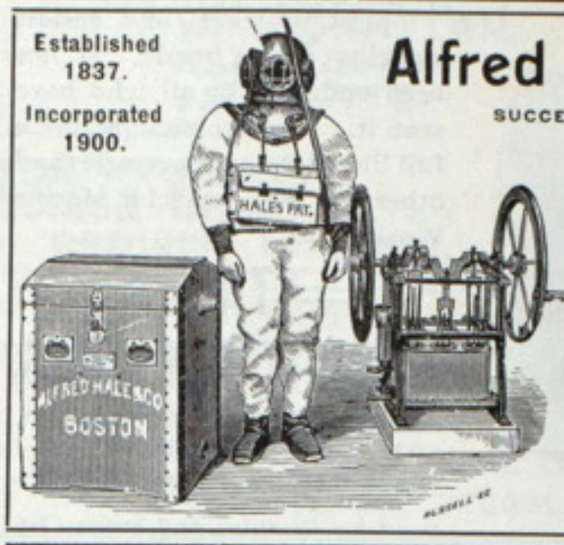
Suited to both Marine and Stationary Boilers.

Prevents formation of scale, removes old scale, and reduces fuel bills.

In use on a number of steam vessels on the Great Lakes.

H J REYNOLDS,
721 PERRY-PAYNE BLDG, CLEVELAND, O.

Established 1837.
Incorporated 1900.



Alfred Hale Rubber Co.

SUCCESSORS TO ALFRED HALE & CO.

DIVING APPARATUS

OUR SPECIALTY.

Repair Cloth.
Rubber Cement.

OFFICE AND FACTORY:
387 E. Eighth St., SO. BOSTON, MASS.

THE MARINE DEPARTMENT

of the Geo. F. Blake Mfg. Co. take pleasure in announcing that they were awarded the Grand Prix at the recent Exposition at Paris, for their special exhibit of Marine Pumps, Condensers, etc.

Send for new Catalogue of Marine Specialties.

THE GEO. F. BLAKE MFG. CO., 91 Liberty St., N. Y. City.

HENRY R. WORTHINGTON, PUMPING MACHINERY.

MARINE AIR AND FEED PUMPS
A SPECIALTY.

BOSTON. CHICAGO. PHILADELPHIA. ST. LOUIS. BUTTE.

WATER METERS.

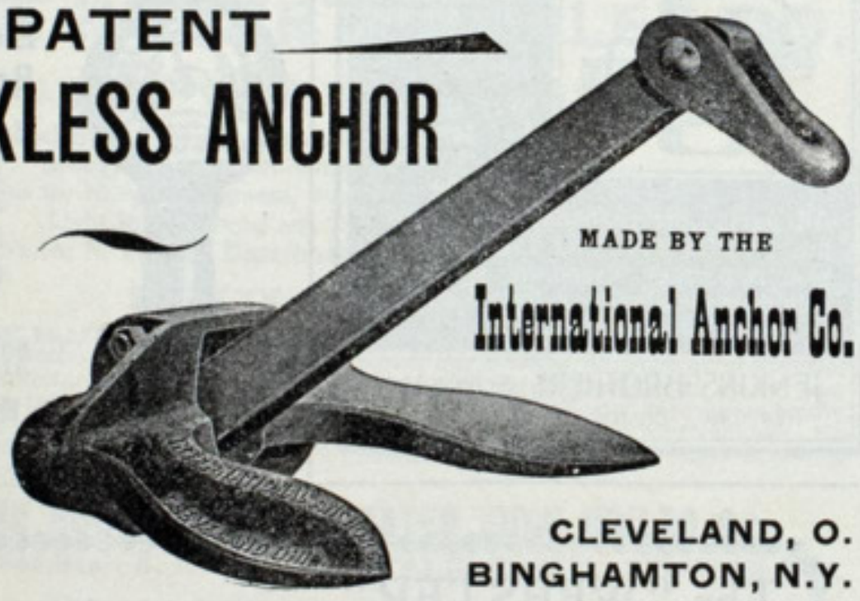
120 Liberty St., NEW YORK.

CLEVELAND. PITTSBURG. ATLANTA. SAN FRANCISCO NEW ORLEANS.

Howard H. Baker & Co. SHIP CHANDLERS AND SAIL MAKERS,

18 to 26 Terrace, BUFFALO, N. Y.

NEW PATENT STOCKLESS ANCHOR



MADE BY THE

International Anchor Co.

Catalogues Mailed Upon Application.

CLEVELAND, O.
BINGHAMTON, N.Y.

ELASTIC SEAM-COMPOSITION TRADE MARK

For Decks and all other Seams,
Weather Checks,
Floors, Skylights, Etc.

AND **ELASTIC SEAM PAINT**
WHITE, BLACK AND COLORS,
IS BEING USED BY

U. S. ARMY TRANSPORTS, AMERICAN LINE, ATLAS LINE,
OCEAN STEAMSHIP CO., OLD DOMINION STEAMSHIP CO.,
FIRE BOAT NEW YORKER, PANAMA RAILROAD STEAMSHIP CO.
L. BOYER'S SON'S TRANSPORTATION CO.,
NEW YORK & CUBA MAIL STEAMSHIP CO., (WARD LINE,)
MERRITT & CHAPMAN D. & W. CO. PENNSYLVANIA RAILROAD CO., Etc.

TO BE BOUGHT OF
Anthony S. Morse, 210 Commercial St., Boston.
Cook & Co., Tacoma, Wash.
Jennison Hardware Co., Bay City, Mich.
J. F. Donahue & Co., Sandusky, O.
The Chas. F. Beebe Co., Portland, Ore.
Geo. B. Carpenter & Co., Chicago, Ill.
Elisha Webb & Sons, 108 S. Delaware, Philadelphia.
H. Steffens, 337-339 Fell St., Baltimore.

And all marine hardware stores in New York and Brooklyn.

Samples sent on receipt of 30 cents in stamps. An agent wanted in each seaport town.

COLE & KUHLS, Sole Manufacturers,
Office and Factory, foot of 24th St. [Mention this Paper.] **BROOKLYN, N. Y.**

BALDT PATENT STOCKLESS ANCHOR

Made of the finest quality of open-hearth steel, and constructed on the ball and socket principle. Many points of superiority over ordinary stockless anchors.

BALDT ANCHOR COMPANY,
CHESTER, PA.

WALTER MILLER, PERRY-PAYNE BUILDING, CLEVELAND, O.

Representative for the Great Lakes. We keep a large number of Anchors in stock.

H. G. TROUT.

KING IRON WORKS,

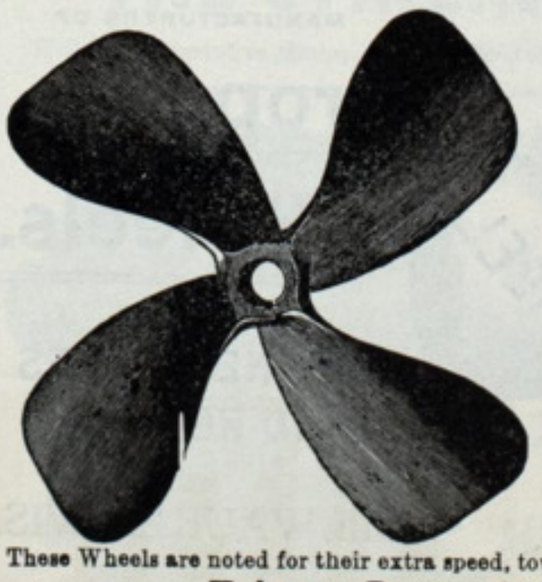
BUFFALO, N. Y.

MANUFACTURERS OF

TRIPLE EXPANSION, FORE-AND-AFT AND STEEPLE COMPOUND MARINE ENGINES,

High and Low Pressure Engines,
Sectional Propellers,
Tug and Yacht Wheels.

Cowles Aluminum and Manganese Bronze Propeller Wheels.



These Wheels are noted for their extra speed, towing power and proportionate saving of coal.

Prices Quoted on Application.

Mott's "Richmond" Pump Closet.

THE "Richmond" is the simplest, quickest and easiest working Closet made. It has been endorsed by all who have seen it. We also manufacture a full line of Baths, Lavatories and other Sanitary goods for Marine Work.

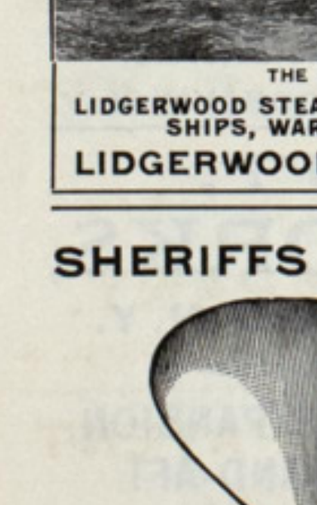
THE
J. L. MOTT IRON WORKS,
84-90 Beekman St., NEW YORK CITY.
332 Boylston St., BOSTON, MASS.
1128 Walnut St,, PHILADELPHIA, PA.

Established 1828.

Send for Circular and Price List.

SIXTH REVISED EDITION.
Scott's Coast Pilot for 1901.
Great Lakes and Connecting Waters,
AT $1.50.
For sale by MARINE REVIEW PUB. CO.

Queen City Patent Hydraulic Steerer.



The Best and Most Reliable.
Generates No Heat In Pilot House.
Has Large Hand Wheel.
Can be Changed from Power to Hand Steering Instantly.
A Favorite with Pilots.
Send for References.
Queen City Engineering Co., Buffalo, N. Y.

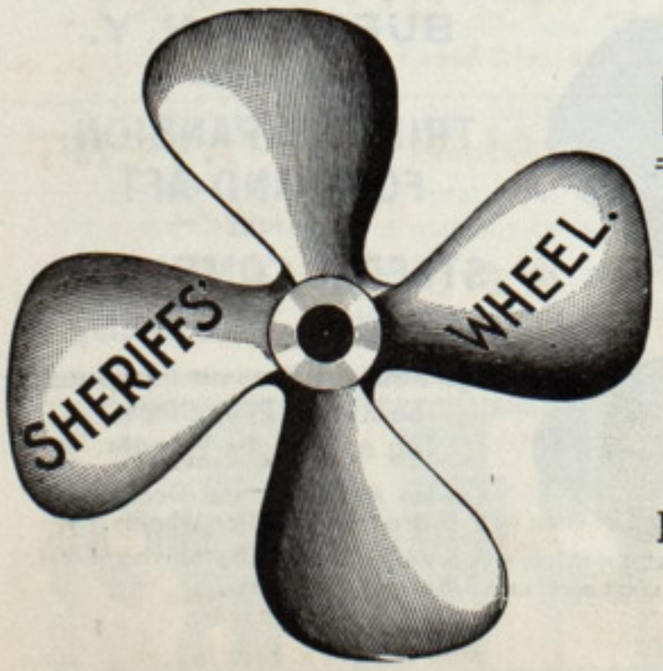
ALFRED B. SANDS & SON
MARINE PLUMBERS
AND MANUFACTURERS OF
Marine Plumbing Specialties.

Marine Water Closet for either above or below water line.
Folding Lavatories, Ventilators, Pumps, Tanks, &c., &c.
134 BEEKMAN ST., NEW YORK.

THE LIDGERWOOD-MILLER-MARINE CABLEWAY
WILL TRANSFER COAL, AMMUNITION, SUPPLIES AND PROVISIONS, FROM SHIP TO SHIP AT SEA

THE ONLY PRACTICAL DEVICE FOR COALING AT SEA.
LIDGERWOOD STEAM AND ELECTRIC HOISTS FOR WAR VESSELS, STEAMSHIPS, WAREHOUSES AND DOCKS. Send for Catalogue.
LIDGERWOOD MFG. CO., 96 LIBERTY ST., NEW YORK.

SHERIFFS MANUFACTURING COMPANY
MANUFACTURERS OF
Propeller Wheels.



MARINE ENGINES AND REPAIRS.
MILWAUKEE, WIS.
TELEPHONE S.–163

MARINE CHAIN
OF ALL KINDS.
Ships Cables, Dredge Chains,
Stud Link and Marine Railway Chains,
Steam Shovel Chains, Boom Chains, Etc.
CERTIFICATE OF TEST FURNISHED.
STANDARD CHAIN CO.
PITTSBURGH, PA.

Bureau of Shipping Information.
Such is the office of the Marine Review, Cleveland. We try to keep in touch with all that is going on among ship owners and ship builders and never tire of answering inquiry on this score from advertising patrons. Write us.
THE MARINE REVIEW PUB. CO., CLEVELAND, O.

Sellers' Restarting Injector

A strictly first class machine at moderate cost.
Perfectly automatic, has wide range of capacities, and raises water promptly with hot or cold pipes.
Very simple, has few parts and is easily repaired.
All parts interchangeable, made of the best bronze, and the workmanship is perfect. Send for special catalogue descriptive of this Injector.
JENKINS BROTHERS, Selling Agents
NEW YORK, BOSTON, PHILA., CHICAGO

CHAS. CORY & SON,
Manufacturers of the
Mechanical and Electric Marine Telegraph,

Electrical Helm Indicators
Electric Call Bells.
Engine Bells and Brass Work of all descriptions, Shrieking and Siren Whistles.
278 DIVISION ST.,
NEW YORK CITY.

The "WEBSTER" MARINE TYPE OF FEED HEATER

This Heater possesses exclusive features of economic advantage. Hot well boiler feed re-heated with the exhaust steam from auxiliaries or elsewhere, effecting large economy in fuel or increase in power developed.
Reduces boiler repairs.
The Heater is automatic in its operation; practically no attention is required.
No Internal floats are used.
All Parts are readily accessible.
Heaters designed to fit in special locations.
Construction details and further particulars will be furnished upon inquiry.
WARREN WEBSTER & CO., CAMDEN, NEW JERSEY.

THE BABCOCK & WILCOX CO.

HAVE EQUIPPED THE FOLLOWING LAKE VESSELS WITH THEIR FORGED STEEL WATER TUBE BOILERS:

ZENITH CITY,
QUEEN CITY,
EDNA G.,
CRESCENT CITY,
SUPERIOR CITY,
EMPIRE CITY,
ALEX McDOUGALL,
PRESQUE ISLE,
MATAAFA,
MAUNALOA,
MALIETOA,
JOHN W. GATES,
JAMES J. HILL,
ISAAC L. ELLWOOD,
WM. EDENBORN,
W. S. GRATTAN,
HARVARD,
LAFAYETTE,
CORNELL,
PRINCETON,
RENSSELAER,
PARAGUAY,
ASUNCION.

BOILERS NOW UNDER CONSTRUCTION FOR U. S. MONITOR WYOMING,
U. S. CRUISER CINCINNATI,
U. S. CRUISER RALEIGH,
U. S. CRUISER TACOMA,
U. S. CRUISER GALVESTON,
U. S. CRUISER CHATTANOOGA,
U. S. CRUISER DENVER,
U. S. CRUISER DES MOINES,
U. S. CRUISER CLEVELAND,
AND SEVERAL LARGE VESSELS FOR THE PACIFIC COAST.

The Babcock & Wilcox Co.,
29 CORTLANDT ST.,
NEW YORK.

THE BUFFALO DRY DOCK CO.

GANSON STREET AND BUFFALO RIVER.

Operating Four Docks, Sixty-ton Shear Legs, and in every way Equipped

WITH MODERN MACHINERY FOR

Prompt and Economical Repairs

AND FOR THE BUILDING OF STEEL AND WOODEN SHIPS.

OFFICE, GANSON ST., TELEPHONE 515 SENECA.

Edward Smith, President, Tel. 279 Seneca.
Edward Smith, Residence Tel. 209 Bryant.
Geo. B. Drake, Ass't to President, Residence Tel. 798 Bryant.
Wm. W. Watterson, Superintendent, Residence Tel. 123 Park.

THE ROBERTS BOILER CO.

HAS BUILT OVER 1000 BOILERS TO DATE

For Launches, Yachts, Passenger and Freight Steamers,
Dredges, Tugs, Stern-wheelers, Canalers;
Also for Navy Department, War Department, Treasury Department,
Light-House Board and Revenue Cutter Service;
Also for N. Y. Dock Department and U. S. Supervisor, Harbor of N. Y.

SAFETY AND ECONOMY.

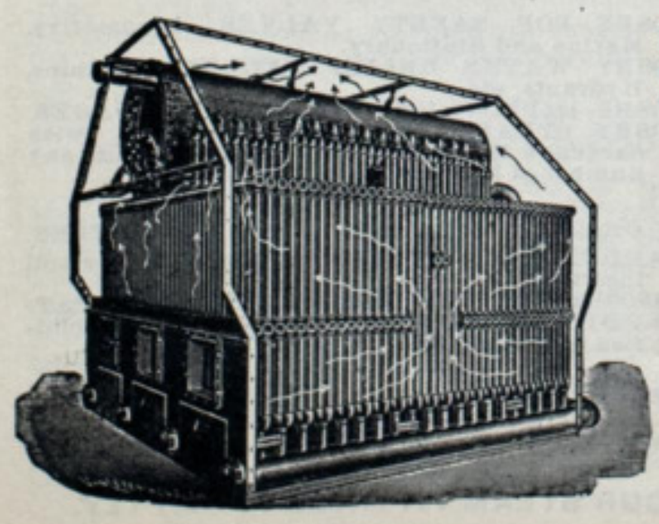
NEVER KILLED A MAN OR HAD A SERIOUS ACCIDENT. $250,000 capital. Works covering 29,000 square feet of ground. Never had a boiler returned on account of dissatisfaction. Every boiler warranted. All material made specially for our use. All boilers tested at 500 pounds hydrostatic pressure and 250 pounds of steam before shipping. Workmanship strictly first-class. All joints screwed and reliable. No expanded joints. State your requirements and we will furnish specifications. Correspondence solicited.

THE ROBERTS SAFETY WATER TUBE BOILER CO.,

Works, Red Bank, N. J. 39 and 41 Cortlandt St., NEW YORK CITY.

TELEPHONE: NEW YORK OFFICE, 599 CORTLANDT. OFFICE OF WORKS, 49 RED BANK, N. J. Cable Address, "BRUNIVA, NEWYORK."

THE "TAYLOR" YACHT BOILER



Has held the record three seasons on the fastest yacht on the great lakes.

Guaranteed against Rupture of Tubes.

Will not Prime in the Roughest Sea.

MANUFACTURED BY

Detroit Screw Works,
FOOT OF REOPELLE ST.,
DETROIT, MICH., U. S. A.

ALL THE NAVIES OF THE LEADING GOVERNMENTS OF THE WORLD USE

The Niclausse Water Tube Boiler,

ADOPTED BY THE NAVIES OF

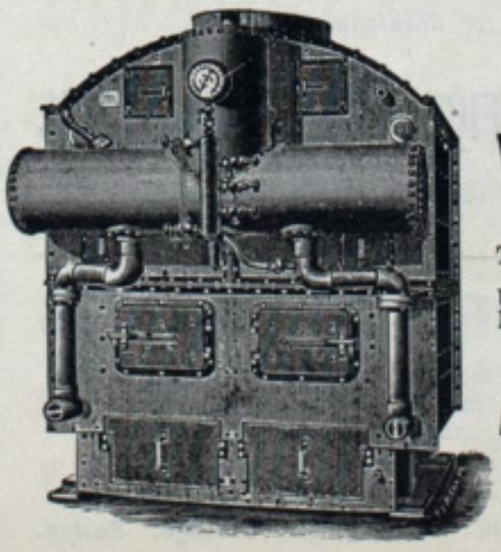
UNITED STATES,
ENGLAND,
FRANCE,
RUSSIA,
ITALY,
GERMANY,
SPAIN,
Argentine Republic,
CHILI.

We have now in course of construction at our Works 60,000 H. P. Niclausse Boilers for the following war vessels:

U. S. Monitor CONNECTICUT, } Building at the Ship Yard of the Bat Iron Works, Bath, Me.
U. S. Battleship MAINE, Russian Battleship RETVIZAN, Russian Cruiser VARIAG, } Building at Wm. Cramp & Sons Ship Yards, Philadelphia.

THE STIRLING COMPANY,

Write for Descriptive Matter. General Offices Pullman Building, Chicago, Ill.



ALMY'S PATENT

SECTIONAL

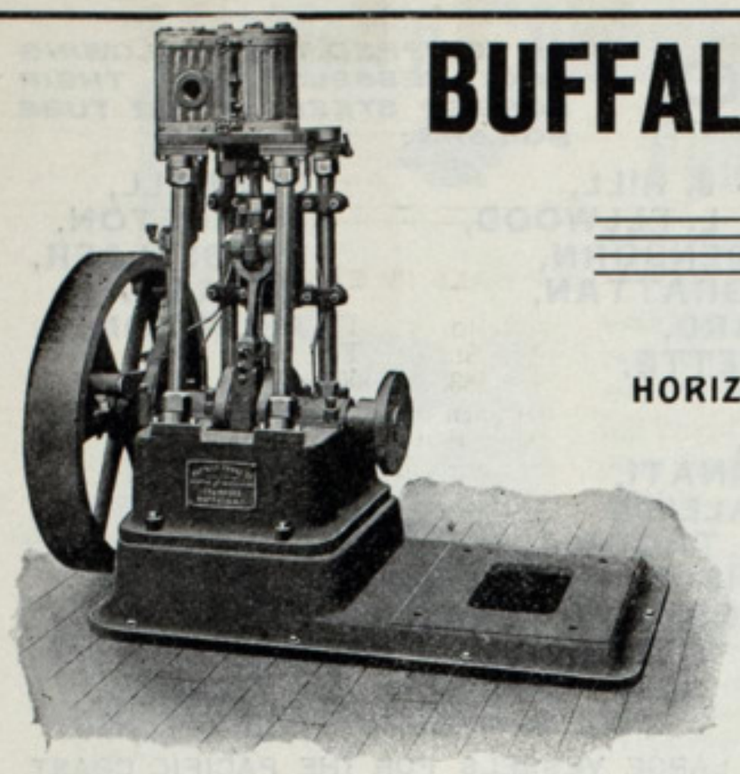
Water Tube Boilers.

NOW USED IN

Thirty Passenger Boats and 100 Steam Yachts ranging from 50 to 250 feet in length,
U. S. Torpedo Boat "Stiletto."
Numerous Small Launches and Stationary Boiler also giving most excellent results.

ALMY WATER-TUBE BOILER CO.,

178-184 Allens Avenue, near Rhodes St.
PROVIDENCE, R. I.



BUFFALO FORGE COMPANY

ENGINES

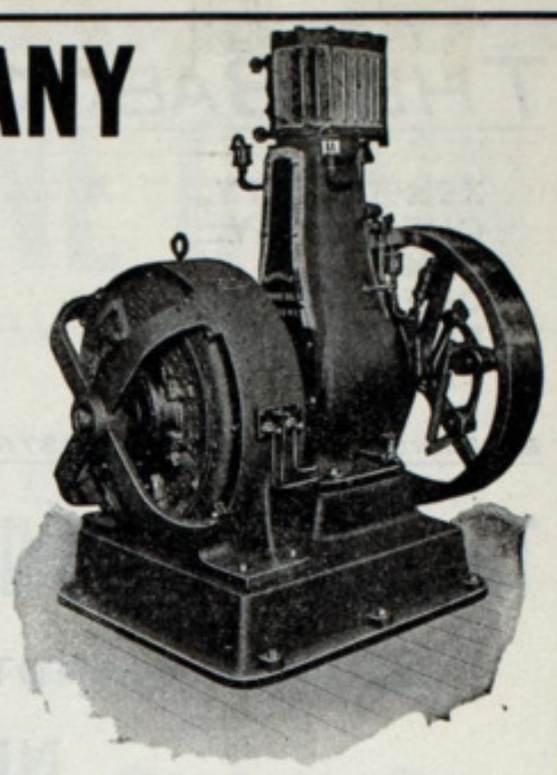
HORIZONTAL, VERTICAL and MARINE TYPES,
SIMPLE and COMPOUND.

MARINE LIGHTING SETS.

BUFFALO FORGE COMPANY,

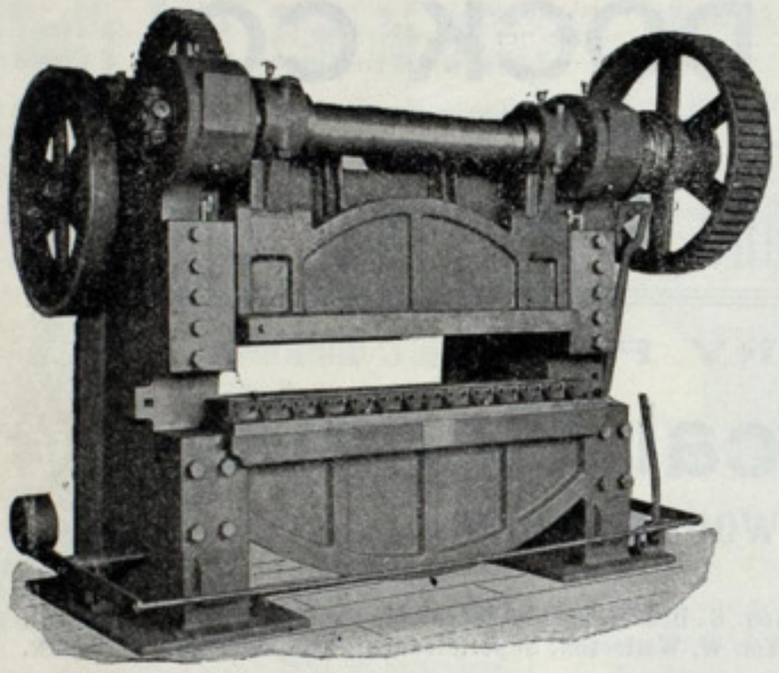
BUFFALO, N.Y.

NEW YORK. CHICAGO



Buffalo Marine Engine, arranged for direct connection to Generator.

Buffalo Upright Engine, direct connected to Marine Type Generator.



This illustration shows our

GATE SHEAR

which we build either as a Shear or as a Multiple Punch.

DISTANCE BETWEEN HOUSINGS IS 42 IN.
DEPTH OF THROAT 7 IN.

This machine has an adjustable holding down arrangement for holding the plate level while same is being sheared. We build this machine with any capacity desired, and will be pleased to quote price upon application.

The Cleveland Punch and Shear Works Co.,
CLEVELAND, O., U. S. A.

ASHTON

CAM LEVER POP SAFETY VALVES
AND NON-CORROSIVE STEAM GAGES
give highest efficiency and durability. Specify them and get the best.

THE ASHTON VALVE CO., BOSTON, NEW YORK AND CHICAGO, U. S. A.

GENERAL ELECTRIC COMPANY'S
Projectors.

NAVAL PROJECTOR.
ELECTRICAL CONTROL.

HAND, PILOT-HOUSE OR
ELECTRICAL CONTROL.

Operated from direct-current incandescent lamp circuits.

Write for Catalogue No. 1025.

GENERAL OFFICE, SCHENECTADY, N.Y.

SALES OFFICES IN ALL LARGE CITIES.

JENKINS BROS.' VALVES

are manufactured of the best steam metal, and are fully guaranteed. Why experiment with cheap valves? If you want the **BEST** ask your dealer for valves manufactured by Jenkins Brothers. Remember all genuine are stamped with Trade Mark like cut.

JENKINS BROTHERS. New York Philadelphia, Chicago, Boston.

THE BOURNE-FULLER CO.

CLEVELAND O.

BAR IRON. PIG IRON.

ARCHES AND STRAPS FOR WOODEN VESSELS.

BOILER RIVETS. BOILER TUBES. BRACE IRON.
IRON AND STEEL SHEETS. MACHINERY AND TOOL STEEL.
BESSEMER AND OPEN HEARTH STEEL.
SHIP PLATES, BOILER PLATES, SHIP RIVETS.
BEAMS, CHANNELS, ANGLES, BARS, AND OTHER SHAPES.
BILLETS, BLOOMS AND FORGINGS.
"BYERS" FULL WEIGHT WROUGHT IRON PIPE.

CROSBY STEAM GAGE AND VALVE CO.

CROSBY POP SAFETY VALVES, Locomotive, Marine and Stationary.
CROSBY WATER RELIEF VALVES, for Pumps, Hydrants, etc.
CROSBY IMPROVED STEAM PRESSURE GAGES
CROSBY STEAM ENGINE INDICATORS, with Sargent's Electrical Attachment for taking any number of Diagrams simultaneously.

The Original SINGLE BELL CHIME WHISTLES.
BRANDEN PUMP VALVES; rubber with wire-coil insertion.
BOSWORTH FEED-WATER REGULATOR, PATENT GAGE TESTER, and many other specialties in Steam Lines.

Main Office and Works: Boston, Mass.

Stores; Boston, New York, Chicago, and London Eng.

WE WILL REPAIR YOUR STEAM FITTINGS PROMPTLY.